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FM 9-4

DEPARTMENT OF THE ARMY FIELD MANUAL

ORDNANCE GENERAL AND DEPOT SUPPORT SERVICE

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HEADQUARTERS, DEPARTMENT OF THE ARMY
NOVEMBER 1959

FIELD MANUAL }
No. 9-4

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON 25, D. C., 20 November 1959

ORDNANCE GENERAL AND DEPOT SUPPORT SERVICE

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* This manual supersedes those portions of FM 9-10, 15 August 1951, which deal with general and depot support maintenance and general and depot support supply in the field.

CHAPTER 1

INTRODUCTION

1. Purpose and Scope

This manual is a guide for ordnance personnel and other individuals concerned with providing ordnance general and depot support units to the Army in the field. It describes the responsibilities and functions of ordnance general and depot support services in a theater of operations and presents organizational and operational techniques for the provision and management of these services. Information contained in this manual is pertinent to the support of ordnance class II and IV ordnance items; i.e., all ordnance materiel except ammunition. (Hereafter, the term class II as used in this manual includes class IV, unless otherwise indicated.) Information peculiar to class V materiel is contained in FM 9-5 (Ordnance Ammunition Service). The detailed operation of class II and IV direct support is covered in FM 9-3 (Ordnance Direct Support Service). The material contained herein is consistent with the basic Ordnance doctrine expressed in FM 9-1 (Ordnance Service in the Field) and is applicable without modification to both nuclear and nonnuclear warfare.

2. The Ordnance Mission

a. Success of the Army in the field depends on manpower, mobility, and firepower. Ordnance vehicles, weapons systems, and ammunition provide most of the mobility and firepower. Complete ordnance service to the Army in the field consists of three primary functions: supply of serviceable ordnance materiel, repair of this materiel when it becomes unserviceable, and evacuation of materiel to facilities where it can be repaired or reclaimed.

b. The ordnance units which provide direct support supply, maintenance, and evacuation services cannot provide the facilities or the extensive supply stocks needed to perform com-

plex repairs. Therefore, the three basic ordnance functions must be performed at more than one level. Experience has proved the requirement for three such support levels: direct, general, and depot (fig. 1).

- (1) Direct support units operate in the immediate vicinity of users to provide a combination of the supply, maintenance, and evacuation services needed most frequently.
- (2) General support units provide supply distribution facilities and assume responsibility for that maintenance and evacuation which is beyond the capability or capacity of direct support. Together, direct and general support constitute the "field" category of service.
- (3) Depot level activities constitute the "depot" category of service and provide the theater supply stockpiles required to insure an uninterrupted flow of ordnance supplies to field supply and maintenance facilities. Depot support service includes the limited reconditioning (or rebuild, subject to Department of the Army approval) of unserviceable ordnance materiel for return to supply stockpiles.

3. Supply Support

Depot support is the base of operations for ordnance supply support in the theater of operations. Depot level activities receive supplies entering the theater and maintain the primary reservoir of stock to support the field armies. General support supply is the vital link between depot supply and direct support. Small, semimobile, general support distribution units store those supplies needed for supported units in a limited geographical area, while depot sup-

port supply activities concentrate on the supply of bulk quantities to general support supply units. Thus, dispersion and distribution of stocks throughout the theater is facilitated.

4. Maintenance Support

a. General. The ordnance maintenance system in the theater is designed to effect prompt return of repaired materiel to users and to supply facilities conveniently close to users, thus avoiding the need for establishing large stocks of replacement items in the vicinity of all using units. To effectively accomplish this mission, ordnance maintenance service must assist users to keep ordnance materiel in serviceable condition and must repair all unserviceable, economically repairable items for which a known requirement exists. These repairs should be performed at the minimum practicable distance from the user. Complete and efficiently performed field maintenance extends the service life of ordnance items and holds the demand for input of new items into the theater to the lowest possible level. Field maintenance tasks range from simple jobs requiring only a short time to complex jobs requiring many man-hours.

b. Direct Support Maintenance. Direct support units concentrate on simple repairs, which can be accomplished expeditiously, and replace those items which they cannot repair. This policy results in returning the greatest possible number of items to users with a minimum of delay. To accomplish its mission successfully, direct support usually limits its repairs to the replacement of defective components and arranges for the evacuation of the unserviceable components to general support for repair.

c. General Support Maintenance.

- (1) General support is responsible for accomplishing that part of the field maintenance mission which cannot be accomplished by direct support, or which is so time consuming as to preclude expeditious repair at direct support level. Normally, items repaired at the general support level are returned to supply channels, thus reducing the demands for new replacement items.

- (2) General support maintenance units

have a greater capability than the direct support units, primarily because they are authorized to expend more time on individual jobs. Moreover, general support units may possess certain tools and skills not found in direct support units.

d. Depot Maintenance. The objective of depot maintenance is the replenishment of theater stockpiles. In most cases, this category of maintenance is organized on a theater-wide basis under a single control agency. A distinguishing feature of depot maintenance is that it is normally conducted on a production line basis. The maintenance work which is beyond the capability or capacity of field maintenance flows through collecting points into depot maintenance facilities. Such facilities are not normally established until a communications zone has been created. Conditions must be sufficiently stable to make such facilities relatively free from attack either by ground forces or by air. When there is a threat of nuclear attack, the installations must be well concealed, and small enough to be unprofitable targets.

- (1) Production methods of field and depot maintenance usually differ. Field maintenance units normally handle a variety of jobs, performing each job on an individual basis as it is received. At depot level, the accumulation of quantities of like items makes it possible and profitable for individual units and installations to specialize in one type job or a limited variety of jobs in order that efficient and economical production methods may be used. Dispersion of assets is achieved by locating unserviceable and repaired items at a distance from the depot maintenance activity.
- (2) There are some maintenance operations which are withheld from field maintenance due to low frequency, high cost of test equipment, and excessive man-hours required. Such operations are best consolidated at one point in a theater, or in depot facilities in the continental United States (CONUS).

5. Evacuation Support

Evacuation is the controlled process of collecting, classifying, and shipping unserviceable materiel to appropriate reclamation, maintenance,

or disposal facilities. Collecting points are established at both general and depot support levels to receive and process evacuated materiel.

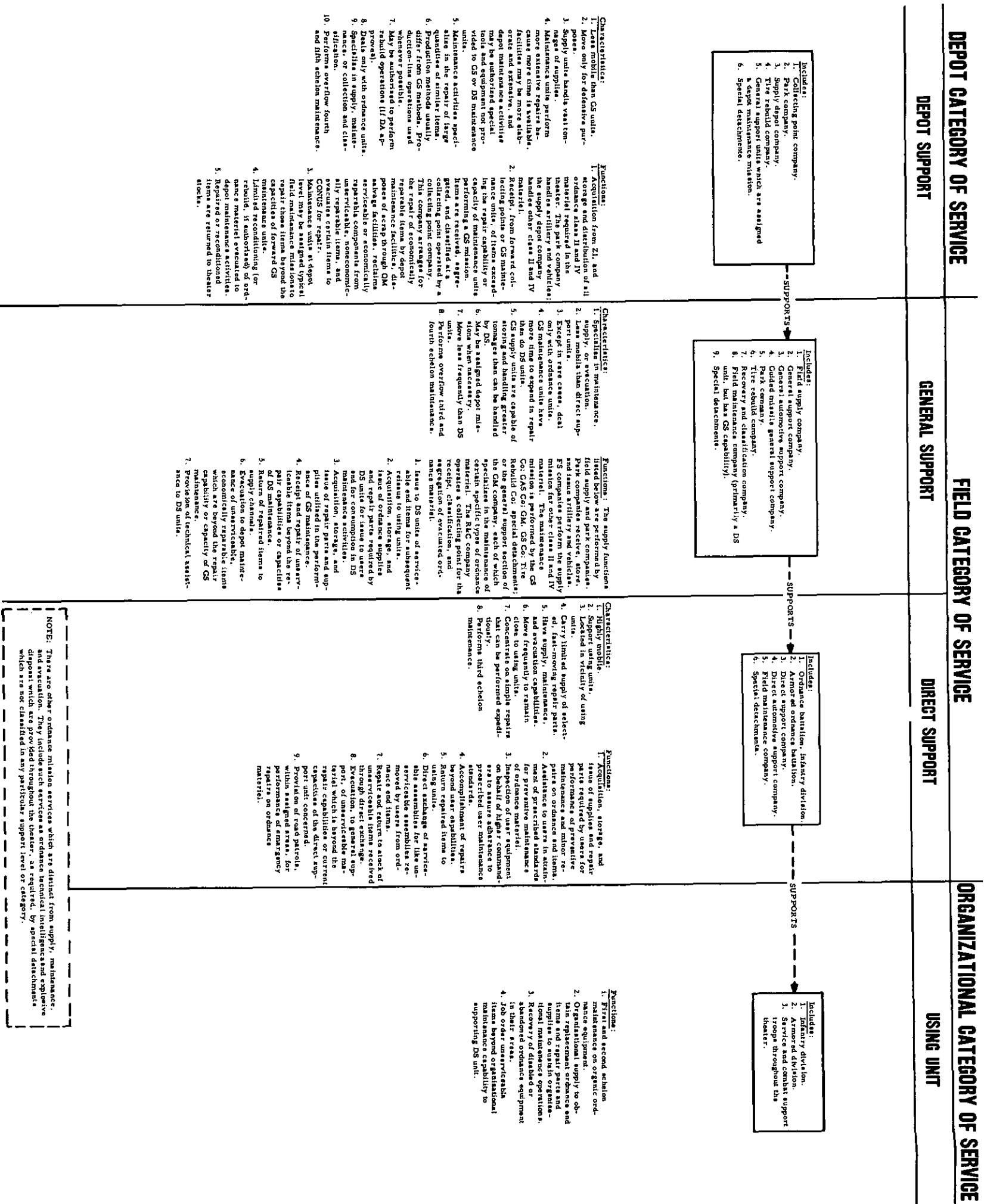


Figure 1. Ordnance levels and categories of support, relationships and functions.

CORPS SERVICE AREA

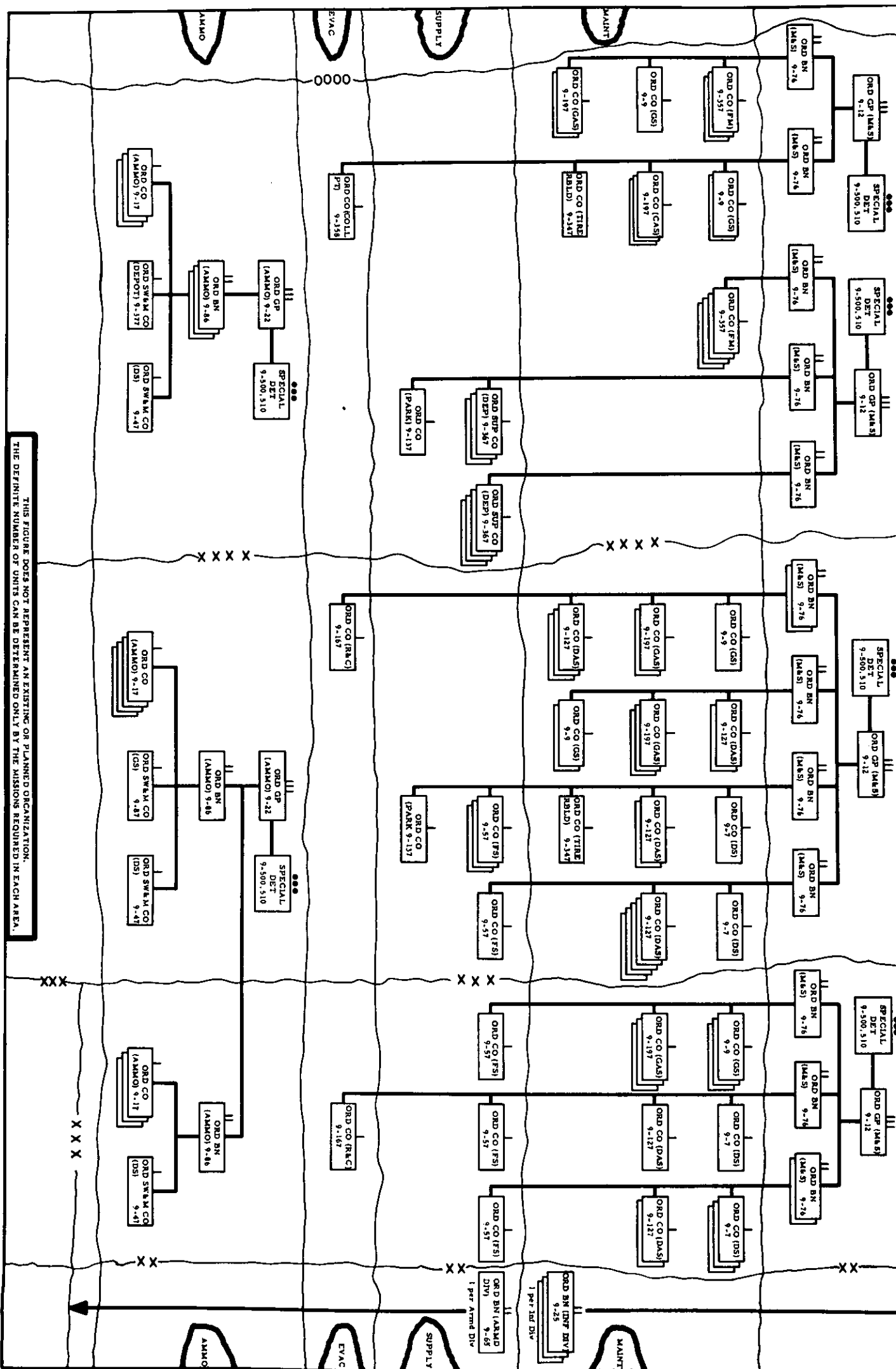


Figure 2. Type ordnance organization in a theater of operations.

CHAPTER 2

ORGANIZATION FOR GENERAL AND DEPOT SUPPORT SERVICE

Section I. ORGANIZATION

6. Organizational Specialization

There are over four hundred different types of United States Army troop units, each authorized its own combination of ordnance end items. Most types of units will be found in any theater of operations. Inasmuch as theaters differ greatly in size and character, there can be no standard pattern for distribution of types and numbers of military units throughout the various sectors of a theater. An almost infinite number of combinations is possible. The flexibility which ordnance service must possess in order to provide the types and quantities of support required in any sector of any theater is provided by ordnance specialized service battalions, companies, teams, and detachments, which can be organized into the combinations required in various situations. Figure 2 shows a typical organization of ordnance units in a theater of operations. The quantities of units and their organization may vary widely, depending primarily on geography, quantities of equipment, and units to be supported. For general information on the mission, assignment, capabilities, mobility, and organization of general and depot support units, see appendix II.

a. General and depot support units include companies, teams, and detachments.

- (1) Companies are designed to specialize in one of the three primary support functions: supply, maintenance, or evacuation. Within these functional areas, many units are further specialized. As an example, the general automotive support company maintains only general purpose vehicles.
- (2) Teams, in most cases, duplicate company capabilities, but on a smaller scale. They are used to augment com-

panies or to operate under conditions which do not justify the use of a company. Specialized detachments provide services not within the capabilities of companies. Teams and detachments authorized by TOE's 9-500 and 9-510 are used for this purpose (app. II). They may be used in any geographical area of the theater, their assignment depending entirely on the mission to be performed.

b. Supply and maintenance units further specialize in the support of certain specific commodity types.

- (1) *Supply*. At general support level, small end items and repair parts are handled by the field supply company. At depot level, these items are handled by the supply depot company. The park company handles vehicles and artillery at both levels.
- (2) *Maintenance*. Maintenance units and the commodities in which they specialize include:
 - (a) *General support company*—specializing in the maintenance of combat vehicles, artillery, fire control instruments, and small arms.
 - (b) *General automotive support company*—specializing in the maintenance of general purpose vehicles.
 - (c) *Guided missile general support company*—specializing in the maintenance of guided missiles and missile systems.
 - (d) *Tire rebuild company*—specializing in the maintenance of tires and tubes.

(e) *Field maintenance company*—specializing in the maintenance of wheel vehicles and small arms. This company is primarily a direct support unit, designed to furnish direct support supply and maintenance service to service troops and transients in an assigned area of the communications zone (COMMZ). However, the service platoon of the company contains a general support section which performs fourth echelon maintenance on wheel vehicles.

c. Appropriate combinations of companies, augmented as necessary by TOE 9-500 and 9-510 units, provide complete general and depot support supply and maintenance service for the various sectors of the theater. For example, if a particular sector contains a large number of combat vehicles, the support organization can be designed with a preponderance of general support companies. In other areas where the density of general purpose vehicles is heavy and only a few combat vehicles are supported, the support organization can be designed so that general automotive support companies will predominate. Moreover, when the density of a particular item in a particular sector of the theater is so low as to make the use of a company-size unit unnecessary, general support maintenance may be provided by a team or detachment (as in the case of guided missiles).

d. There are two units designed to perform the evacuation function: the recovery and classification company, a general support unit; and the collecting point company, a depot support unit. The recovery and classification company is normally assigned to a field army, while the collecting point company is utilized in the COMMZ.

7. Battalions

All ordnance companies are administratively self-sufficient. However, command, control, and coordination of effort are provided by attaching three to seven companies to a battalion headquarters. Battalions may combine direct, general, and depot support units, or their composition may be limited to units of one support level so that the mission of the battalion may be

simplified (fig. 2). Ordnance units may also be organized into direct support battalions, general support battalions, and depot support battalions.

a. *General Support Battalions*. Under conditions where large quantities of equipment are supported within a limited geographical area, specialized general support battalions may be employed. Specialized battalions are organized to perform one of the primary support functions. Among the various types of specialized battalions are:

- (1) *Supply battalion*. This battalion is composed of several field supply companies and operates the depot which issues class II supplies to the field army.
- (2) *Park battalion*. Normally, one supply battalion in the field army service area and one in the COMMZ will include a park company to issue vehicles and artillery.
- (3) *Collection and classification battalion*. Recovery and classification companies and maintenance companies make up this battalion. It operates one or more collecting points to support the field army service area and to receive items evacuated from the forward collecting points.
- (4) *Maintenance battalion*. This battalion is composed of general support maintenance companies. It provides overflow support to the forward general support maintenance companies, supports the collecting points, and may be assigned maintenance missions of a specialized nature (such as for low density items).

Battalions organized as shown above may be employed either in a field army or in the COMMZ.

b. *Depot Support Battalions*. Battalions engaged in depot operations in the COMMZ may be specialized in the functional categories described above. These battalions will include other units peculiar to depot operations such as the collecting point company and the supply depot company. Collecting point battalions in the COMMZ are composed of collecting point companies and maintenance companies. They provide depot level evacuation service for the

field armies and general support evacuation service for the COMMZ.

8. Groups

Complete ordnance class II service in any sector of a major theater usually requires several ordnance battalions. The ordnance officers of a field army, theater army, or logistical command can exercise direct control over one or two such battalions. If three or more are required, an ordnance group should be organized. Groups are formed by attaching three to five battalions to an ordnance maintenance and supply group headquarters.

a. Normally, four maintenance and supply group headquarters are assigned to each field army. Each corps area will usually have a group headquarters. In the organization depicted in

figure 2, there are two groups (an ammunition group and a composite maintenance and supply group) in the field army service area, and a maintenance and supply group in each corps service area. When there is a lesser concentration of ordnance units in the corps service area, two maintenance and supply groups may be provided in the field army service area, with one of these groups providing maintenance and supply service to corps troops. Other organizations may be utilized at the discretion of the field army commander, based upon recommendations of the field army ordnance officer.

b. In the COMMZ, ordnance groups are provided on an "as needed" basis. These groups may be assigned on a geographical basis or on a functional basis, depending upon the number of units employed and the size of the zone.

Section II. PERSONNEL—TYPES, DUTIES, AND QUALIFICATIONS

9. Introduction

a. The responsibilities of personnel assigned to a general or depot support unit are generally the same as those of the personnel performing similar functions at direct support level (FM 9-3). Even the duties of personnel are similar in most respects. Variations do exist, however, the principal ones being:

- (1) Above direct support level, the functions of supply and maintenance support are not performed by a single unit. Consequently, general and depot support units concentrate on one of the three basic ordnance functions (supply, maintenance, or evacuation) and the TOE of each unit is designed to facilitate such specialization. Moreover, since general and depot support units usually spend more time on individual repair jobs and have more personnel than direct support units, the maintenance tasks that are undertaken can be more extensive and more complex. This results in more specialization within certain fields at general support level. At depot maintenance level the degree of specialization is even more pronounced.

- (2) Specialization is also evidenced in the composition of units and the titles of personnel as shown in the appropriate TOE's. Whereas maintenance officers in direct support units are expected to have a working knowledge of all materiel supported, at general and depot support levels officers in similar capacities may specialize in guided missile, armament, or automotive maintenance. Supply officers at direct support level must be familiar with all phases of ordnance supply service, whereas in a depot supply activity, officers may be assigned to a single function such as stock control, storage, shipping, etc.

- (3) In many cases, general and depot support units have more tools than direct support units. In addition, units performing depot maintenance may specialize in one type of job or a limited variety of jobs, so that volume production can be facilitated. These factors increase the degree of specialization of these echelons and consequently affect the duties of personnel.

b. When general or depot support units are attached to a battalion or group headquarters,

the headquarters furnishes command, technical, and operational supervision for all attached units. These command headquarters are staffed by a commander, executive officer, a number of staff officers whose duties are assigned by the commander, and sufficient enlisted specialists to assist the staff officers in the performance of their duties.

10. Companies

a. Maintenance Unit Personnel.

- (1) The organization of each of the various types of maintenance units is essentially the same as far as key personnel are concerned. All have a commander, a control (operations or shop) officer, platoon leaders in charge of the various functionalized platoons, and a supply officer, who is either assigned as such or performs this function in addition to his regular duties. The duties and responsibilities of these individuals are essentially the same as those listed in chapter 2, FM 9-3.
- (2) Key noncommissioned personnel include inspectors, shop foremen, section chiefs, first sergeants, motor sergeants, supply sergeants, and mess stewards. They exercise direct supervision over the repairmen and the administrative, mess, and supply personnel who perform the unit's functions.

b. Supply Unit Personnel

- (1) The major elements of the field supply, park, and supply depot companies are headed by officers (commissioned or warrant) who are responsible to the company commanders for the proper operation of the elements (platoons or sections). The field supply and supply depot companies have an executive officer while the park company has a park officer. These officers control and coordinate the operations of the various elements of the units, and are directly responsible to the commander.
- (2) Since the primary mission of these units is supply, most of the enlisted personnel will be supply specialists.

c. Evacuation Unit Personnel.

- (1) The principal assistants to the com-

mander of a recovery and classification company are the operations and reconnaissance officer, the automotive officer, the supply officer, and three recovery section leaders.

- (a) The operations and reconnaissance officer supervises the explosive disposal activities required to assure that the equipment handled by company personnel contains no explosives. This function is performed on equipment in the field prior to movement and prior to acceptance on equipment delivered to the company.
 - (b) The automotive officer supervises the inspection, classification, reclamation, and disposal of automotive equipment.
 - (c) The supply officer supervises the receipt, storage, and issue of required mission supplies. He also supervises the identification, preservation, and shipment of serviceable items to appropriate ordnance supply units, and the shipment of unserviceable items to maintenance units, and scrap items to salvage points.
 - (d) The recovery officer supervises the recovery operations and the activities connected with the movement of equipment into and within the company area, the movement of unserviceable equipment to general support maintenance units, and the movement of serviceable equipment to supply units.
- (2) The principal assistants to the commander of a collecting point company are the operations officer, the chief of the disassembly section, the chief of the service section, and the storage officer.
 - (a) The operations officer exercises broad supervision over the mission activities of the company and direct supervision over the record-keeping activities.
 - (b) The disassembly section chief supervises the receipt, inspection, classification, and disassembly of ordnance equipment.

- (c) The service section chief supervises the activities which support the disassembly section (welding, wrecker operating, etc.), and the processing of components, assemblies, and parts received from the disassembly section.
 - (d) The storage officer supervises the receipt, storage, and issue of supplies required for the mission of the company, and ships those items which are destined for maintenance shops (reparable items), supply units (serviceable items), and disposal units (irreparable material).
- (3) Personnel are needed in evacuation units to perform administrative, mess, and organizational maintenance duties for the unit. In addition, personnel are provided to accomplish the technical mission of the unit. The latter includes supply specialists and supervisors; wrecker, truck, and recovery vehicle operators; welders; carpenters; crane operators; packers and craters; and personnel familiar with the maintenance of the various items of ordnance materiel to serve as inspectors and to clean and disassemble materiel.

d. Specific Qualifications of Personnel. For the specific number, types, and MOS's of personnel in general or depot support units, see the appropriate TOE's. The duties and qualifications of ordnance maintenance and supply officers, warrant officers, and enlisted personnel are outlined in SR's 605-105-5 and 605-105-6, and AR's 611-201 and 611-202. These regulations on career fields contain a compilation of job descriptions appropriate to each military occupational specialty listed in tables of organization.

11. Battalion Headquarters

a. The Headquarters and Headquarters Detachment, Ordnance Maintenance and Supply Battalion TOE 9-76, consists of a battalion headquarters and a headquarters detachment.

- (1) Battalion headquarters consists of:
 - (a) Battalion commander.
 - (b) Executive officer.

- (c) Materiel officer.
 - (d) Adjutant.
 - (e) Chaplain.
 - (f) Missile officer.
 - (g) Operations officer.
 - (h) Armament maintenance officer (WO).
 - (i) Personnel officer (WO).
 - (j) Ordnance supply officer (WO).
- (2) The materiel officer is also the battalion supply officer. The adjutant performs additional duties as intelligence officer and as detachment commander of the headquarters detachment.

b. The headquarters detachment includes the enlisted personnel to assist the battalion commander and his staff in the discharge of their duties.

c. All officers and warrant officers assigned to maintenance and supply duties in this unit must be technically qualified ordnance maintenance officers or ordnance general supply officers. All noncommissioned officers assigned to maintenance and supply duties must be technically qualified in the appropriate ordnance maintenance career field or the ordnance segment of the supply career field.

- (1) The materiel officer is charged with:
 - (a) Supervision of the maintenance operations in the attached ordnance maintenance companies and, where applicable, the inspection of ordnance equipment in the hands of supported organizations.
 - (b) Supervision of recovery, classification, and evacuation of abandoned ordnance materiel and captured enemy equipment of similar types, and submission of recommendations for its utilization or disposition.
 - (c) Organization and supervision of unit safety councils in attached ordnance companies.
 - (d) Inspection of units to detect unsafe practices and hazards in maintenance operations and initiation of corrective action.
- (2) The materiel officer and his assistants supervise ordnance general supply procedures in the battalion. Ordnance

depot companies, when attached to ordnance battalions, normally operate their own stock control sections and submit replenishment requisitions directly to the agency responsible for their supply. The ordnance general supply officer's tasks include:

- (a) Arranging for lateral supply between maintenance companies and equitable distribution of ordnance general supplies within the ordnance battalion.
- (b) Investigating all instances where ordnance general supplies are consumed at excessive rates, and reporting infractions of supply economy to the ordnance battalion commander.
- (c) Insuring adequate supply to supported units and to maintain companies of the battalion.
- (d) Determining the status of supply in any company newly attached to, or to be detached from, the battalion.
- (e) Conducting liaison with the ordnance general supply officers of echelons responsible for the replenishment of supplies to the ordnance companies attached to the battalion.

12. Group Headquarters

a. The Headquarters and Headquarters Detachment, Ordnance Maintenance and Supply Group TOE 9-12, consists of a group headquarters and a headquarters detachment.

- (1) The group headquarters consists of:
 - (a) Group commander.
 - (b) Executive officer.
 - (c) Materiel officer.
 - (d) Guided missile officer.
 - (e) Maintenance officer.
 - (f) Operations officer.
 - (g) Ordnance supply officer.
 - (h) Adjutant.
 - (i) Armament officer (WO).
 - (j) Fire control officer (WO).
 - (k) Food service adviser (WO).
 - (l) Personnel officer (WO).
- (2) The headquarters detachment includes

the enlisted personnel to assist the group commander and his staff in the discharge of their duties. The headquarters detachment accomplishes its own administration. It includes a detachment headquarters section, an administrative section, an operations section, and a materiel section.

b. The ordnance materiel officer coordinates and supervises ordnance maintenance and ordnance general supply in the ordnance group. He submits recommendations on the attachment of ordnance maintenance and general supply companies to battalions, and the assignment of missions to battalions.

c. The ordnance supply officer and the maintenance officer function in the same manner as described for their counterparts in the ordnance battalion headquarters. With their assistants, they provide technical assistance to improve procedures in units attached to the group.

d. The guided missile officer coordinates and supervises ordnance maintenance, supply, and evacuation functions with respect to class II guided missile items.

13. Auxiliary Labor

a. General.

- (1) Seldom does ordnance receive adequate troop allocations to provide the complete service required to support the variety of complex weapons and vehicles found in a theater of operations. Normally, the shortages of units and personnel are more pronounced at general and depot support levels. When sufficient ordnance troops are not available, auxiliary labor provides the means of increasing the ability of ordnance to provide needed support.
- (2) At general and depot support level such labor can be used advantageously in stock control activities; in the storage, handling, and issue of supplies; in packing, crating, and preservation; and in the performance of maintenance, especially at depot level when assembly-line techniques are used. Auxiliary labor normally cannot be

used to handle classified ordnance materiel.

b. *Types.* Auxiliary labor may consist of enemy prisoners of war, local civilian labor, allied military personnel, or any combination thereof. Each of these types will usually be available in a theater of operations. The extent to which they are used will depend on the amount and type of labor available, the tactical situation, and the need. All personnel should be thoroughly screened to reduce the danger of subversive actions.

c. *Procurement.*

- (1) Prisoner of war labor is obtained from military police processing camps through G1. The treatment, control, and limitations on the use of prisoners of war are covered in FM 27-10, DA Pam 27-1, and DA Pam 690-80. Information concerning the handling of enemy prisoners of war is covered in TM 19-500.
- (2) Civilian labor is normally obtained locally under the direction of the G1. Civil affairs detachments establish and supervise local labor offices which assist military forces in the procurement and administration of civilian labor.
- (3) Allied military labor will be made available through military and diplomatic channels of the nations involved.

d. *Utilization.*

- (1) Much of this labor will need little training since it will be used primarily

to perform tasks that are simple or those which can be learned easily on the job. Information on skills of personnel is usually available through local labor offices, in the case of local labor, and from military police processing camps, in the case of prisoners of war. This information should be used when employing such labor in order to profit from their experience, reduce training requirements, increase production, and permit U.S. military personnel to assume their duties.

- (2) Auxiliary labor can be used advantageously in any operation, but it is particularly adaptable to storing, handling, and preserving supplies and equipment. In these operations, minimum training is required. TM's 743-200 and 743-200-1 contain information on the training of personnel to be utilized in the storage and handling of materiel and its preservation, packaging, and packing.

e. *Supervision.*

- (1) In employing auxiliary labor, U.S. military personnel must be appointed as supervisors.
- (2) Capable personnel of the same country, preferably of the same race and creed and, if possible, from the same community as the foreign labor, should be assigned as direct supervisors. These, in turn, are responsible directly to U.S. military supervisors.

CHAPTER 3

MAINTENANCE

Section I. ORGANIZATION, FUNCTIONS, AND RESPONSIBILITIES

14. General

a. The bulk of the unserviceable materiel received by general support maintenance units represents work that exceeds the capabilities or capacities of direct support units. This materiel comes from direct support units, collecting points, or both, depending on the mission of the general support unit and the evacuation policies of the command. The remainder consists of unserviceable organizational equipment that must be repaired, unserviceable materiel received from supply installations, and, in some cases, overflow from other general support maintenance units.

b. General support maintenance units absorb all the work they can and evacuate the overflow to depot support units. In so doing, general support retains the items which can be returned to serviceability most expeditiously. Limits must be imposed on the amount of time general support units may expend in the repair of specific items. These limits vary with the changing situation. The principles of the variable repair time limits system (app. VI) may be applied to solve the time-per-job problem at general support level.

c. Unserviceable materiel evacuated to a depot maintenance facility usually requires extensive repairs. Since irreparable materiel should have been removed from the evacuation channel at direct or general support level, the bulk of the materiel evacuated for depot maintenance will be repairable. However, very often a decision is made at depot maintenance level not to repair certain items, usually because they are not needed in the theater or because it is cheaper, in terms of manpower and material, to procure new ones. In some cases, particularly when replacements are scarce, items are repaired even

though repair expenditures may exceed the cost of new items.

d. The variable repair time limits system (app. VI) explains the various factors which act to limit the workloads that maintenance units can assume. Commanders, by decree, establish the upper time limits (mandatory evacuation time) for each unit, usually in terms of the number of days work authorized to be in a shop. There are no lower time limits (mandatory retention time) for general or depot support units. Decisions as to the retention or evacuation of all repair jobs falling below the upper limits must be made by each unit commander on a day-to-day basis. Many factors influence these decisions, the principal ones being the existing workload and the length of time the unit is expected to remain in position (e.g., a general support unit will not accept jobs that cannot be completed because of an impending movement, even though the man-hours required fall within the limits established for normal operations).

15. Functions and Responsibilities—General Support Maintenance

a. General support maintenance units in a theater of operations complement the efforts of the direct support units to provide complete field maintenance support. Usually the mission of a general support unit is established by assigning it the responsibility for supporting certain designated direct support units. Repair jobs that are beyond the capability or capacity of direct support units are evacuated, normally through a collecting point, to a general support unit. In addition, when the tactical situation requires a direct support unit to move, general support units may accept incomplete repair jobs from direct support units.

b. General support maintenance units, although not a part of the evacuation system (ch. 5), are an essential element in the process established for returning unserviceable, evacuated ordnance equipment to serviceable condition. Each collecting point has specific maintenance units assigned, as required, to perform repairs on evacuated materiel. When recovery and classification companies are not available, ordnance general support maintenance companies may operate collecting points.

c. General support maintenance companies may be assigned responsibility for—

- (1) Providing backup support by performing maintenance which is beyond the capability of direct support units.
- (2) Providing overflow support by performing maintenance which is beyond the capacity of direct support units.
- (3) Performing limited reconditioning on components and assemblies and returning them to supply channels. Limited reconditioning restricts the extent to which an item may be disassembled and the quantity and type of replacement parts that may be utilized in the maintenance operation. It permits only that disassembly and repair parts replacement necessary to return the item to serviceability and prohibits such operations as reboring engine blocks and grinding crankshafts.

16. Functions and Responsibilities—Depot Support Maintenance

a. It is often difficult to identify depot maintenance as being distinctly different from general support maintenance. The overall responsibility of depot maintenance is to repair or recondition those items which are beyond the capability, and in some cases the capacity, of field maintenance. This greater capacity is largely due to the fact that more time is allowed for the performance of depot maintenance. Moreover, depot maintenance activities may find it possible to obtain and use more elaborate tools, equipment, and facilities, since depot maintenance installations are relatively fixed and normally remain in one location for long periods. There are certain features which serve

to identify a maintenance operation as being in the depot category.

- (1) The mission is primarily one of support of theater supply activities rather than lower echelon maintenance units.
- (2) The installations normally remain in one location for relatively long periods.
- (3) The activities are usually assigned the mission of performing limited reconditioning on end items, components, and assemblies.
- (4) Each activity normally specializes in the reconditioning of groups of like items; e.g., liquid-cooled engines, power-train assemblies, or artillery components. Items are accumulated until sufficient quantities of each type are on hand to make a production run. Concentration of entire stocks of like items in a single location should be avoided.
- (5) Production line methods are employed wherever possible (par. 20a and app. VII).
- (6) Depot support maintenance operations are generally geared to long-range requirements. When compared to the operations of lower echelon maintenance activities, depot maintenance operations are relatively less responsive to maintenance requirements of an emergency nature.

b. Not all the above characteristics will always be found in each depot maintenance activity. Moreover, these installations are not necessarily large and vulnerable. The activities may be relatively small, well dispersed, and concealed, and more than one may work on the same type of materiel.

c. When authorized by the Department of the Army, depot maintenance may perform rebuild operations wherein materiel is returned to "like new" condition. This may involve extensive reworking of major components to bring them within acceptable tolerances.

17. Organizational Structure

a. All general support maintenance companies are organized along certain functional lines. With the exception of the ordnance tire

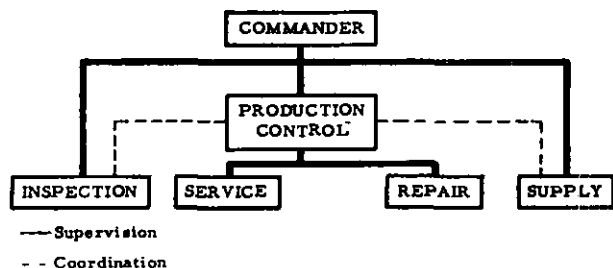


Figure 3. Functional organization of general support maintenance units.

rebuild company, all general support maintenance companies have four basic functional elements: inspection, repair, supply, and service (fig. 3). The ordnance tire rebuild company has no service element.

b. Within the general support company, the production control facility functions as an instrument of the commander in the coordination of all maintenance operations and in the control of those activities whose function is to support maintenance operations; i.e., the supply section, the service section, and the inspection section. Although the agency established to exercise production control responsibility may direct the activities of company inspection personnel in routine operations, it does so in behalf of the commander. Production control personnel must not be allowed to influence inspectors' decisions on final inspections. Similarly, the service and supply platoon functions under the direct control of the platoon commander. Nevertheless, platoon activities are based on the priorities and policies established by the production control element in execution of the commander's directives. The establishment of the inspection function as an activity responsible only to the commander or his representative implements the principle which advocates that the inspecting agency be organizationally independent of the repair sections whose product is subject to inspection. The inspection process discussed above is distinct from whatever inspection procedures are established within the repair sections by shop supervisors as a safeguard against mechanics' errors or omissions.

c. There is no fixed organizational pattern for providing depot support maintenance. The structure of each organization will depend on

the mission, the units required, and the units or auxiliary labor available.

(1) Depot support maintenance activities may be operated by—

- (a) One or more general support maintenance companies.
- (b) One or more general support maintenance companies augmented by auxiliary labor.
- (c) Table of distribution organizations.

(2) A depot activity may be organized as follows:

- (a) Several units may be used, each being assigned the responsibility for certain commodities. Under these conditions, each unit conducts independent operations. This type operation permits the units to disperse without losing effectiveness.
- (b) Several units may be used wherein like sections of each unit are consolidated into commodity shops (small arms, wheel vehicles, etc.). This type organization loses effectiveness when dispersed because of the increased difficulty of retaining administrative control. Moreover, housing and messing are particularly difficult.
- (c) An organization may be designed using military and native personnel authorized by a table of distribution. Key supervisory positions will be filled by military personnel.
- (d) One general support company may be used, augmented by local personnel, cellular units, or both.

18. Technical Supply

a. Each general support maintenance unit and depot maintenance organization has an organic technical supply section. This section is responsible for requesting, receiving, storing, and issuing the repair parts and shop supplies required by the maintenance shops.

b. The only external supply mission that the general support maintenance unit may normally be assigned is the storage and issue of end items of the commodity groups supported by the unit.

These end items are part of the stock assets of the command and will be issued only through direct support units as authorized by the central agency established to control end items. These issues will be controlled by the commander through his ordnance officer or by an agency which the ordnance officer designates.

c. Depot maintenance units have no external supply mission. All materiel repaired in depots is returned to supply channels.

d. Supply operations of general and depot support maintenance activities will be governed by AR 711-16.

Section II. MAINTENANCE MANAGEMENT

20. Production Methods

Ordnance maintenance activities are usually organized into a number of production shops, each shop performing maintenance on like commodities; i.e., small arms, artillery, automotive, missile ground guidance equipment, and missile handling equipment. The three production methods normally employed by maintenance shops are production line, job shop, or bench shop. The choice of method will be dictated by the type of materiel to be repaired, and the personnel, facilities, and time available. Circumstances may make it expedient to use more than one of the methods within a single shop, a very significant factor being the quantity of each type of materiel to be repaired.

a. *Production Line.* The production-line method may be used when a large volume of items must be reconditioned and the procedure can be broken down into a series of independent operations. The production line consists of a series of work stations through which each item is passed, with certain operations being performed at each station. In this type operation, workers of limited capabilities may be trained to skillfully perform a specific job at a particular station. Parts requirements are computed for a production run on the basis of inspection or by a known mortality rate. Production lines should be used whenever possible, as they are the fastest and most efficient type of operation. Production lines will be most frequently used in repairing small arms, automotive components,

19. Technical Assistance

Ordnance general support maintenance units are responsible for providing technical assistance to other ordnance maintenance units. Such assistance may be provided to direct support units when the level of skill in the general support unit is higher than that of the direct support unit. This assistance may be necessary to provide instruction on the maintenance of new equipment entering the theater. A general support unit may also provide technical assistance to another general support unit. All requests for technical assistance will be made through technical channels.

and tires, and in machine shop manufacturing operations.

b. *Job Shop.* The job shop production method is used when a variety of jobs is performed in the shop or when the items are extremely difficult to move. The equipment to be repaired is placed in bays and the work is done by an assigned crew of repairmen. Assemblies may be removed from an item and sent from the job shop to other shops (such as the fuel and electrical shop) for necessary work. General support artillery and vehicle maintenance shops are usually operated as job shops. Parts requirements are determined for each job and are obtained before work is initiated. The job shop method is sometimes referred to as the "bay" type method of shop operation.

c. *Bench Shops.* Bench shops may be used when the repair of small items requires a high degree of technical skill. In this method, the item is repaired by a worker at a bench. Because of the relatively small volume of work done and the limited variety of items to be repaired, it is usually advisable to maintain a stock of parts in the section, the quantity being determined by experience. Bench shops are used for the repair of fuel and electrical assemblies and fire control instruments.

21. Production Control

a. *General.* Production control is the application of common sense, good judgment, and prompt remedial action, coupled with the neces-

sary management tools, to direct and control the flow of work in a manner that results in a maximum output of quality work. Its objective is to make maximum utilization of men, materials, and facilities to prevent bottlenecks from developing in maintenance shops and to assure that shops are working at or near maximum capacity. The operation of production control will vary among ordnance units, the variations being caused by the mission, personnel available, and the type and density of equipment supported. In general, production control will be accomplished according to the procedures outlined in appendixes V and VI. Production control is the responsibility of the production control office.

b. Production Control Office.

- (1) The production control office operates under the supervision of the shop officer (control officer or operations officer) who is directly responsible to the unit commander. The shop officer is assisted by the operations NCO in the planning, records control, and record filing activities of the control office. The control office is staffed with the clerks necessary to assure efficient operation.
- (2) The functions of the control office include:
 - (a) Supervising all shop activities.
 - (b) Coordinating the activities of the shop with the inspection and supply sections.
 - (c) Establishing job priorities in accordance with existing directives.
 - (d) Interpreting and implementing technical directives or specifications received from higher headquarters and technical channels.
 - (e) Analyzing job productivity and improving shop layout, repair techniques, and procedures to promote maximum productivity while maintaining quality standards.
 - (f) Devising methods for and accumulating data for statistical, recurring, and special reports pertaining to maintenance activities, and eliminating unnecessary intershop reports.
 - (g) Establishing and maintaining rec-

ords of all shop operations (app. IV).

- (h) Insuring that shop supervisors understand the methods of routing both work and administrative forms.
- (i) Insuring the accomplishment of maintenance on shop equipment and facilities.

22. Quality Control

a. General. Inspection of materiel constitutes one of the most important aspects of the ordnance maintenance function. The inspection section provides the means by which the commander controls the quality of the work done in his shops. Therefore, the inspectors should be responsible only to the commander, although for operational convenience, routine supervision of company inspectors is exercised by the production control officer. The personnel selected for the inspection section should be highly skilled repairmen. They must be able to diagnose deficiencies in a piece of equipment, prescribe necessary repairs, and accurately determine the adequacy of the repairs performed on equipment coming out of the shops.

b. Inspection Section.

- (1) *Personnel.* The inspection section personnel authorized by TOE may be augmented, if necessary, by capable repairmen from other shop sections. Each shop section should furnish inspectors, when required, who can be relied on to make accurate and complete diagnoses. In small repair sections that are not authorized an inspector by TOE, the section chief will normally be the inspector for the commodities repaired by that section. The composition of the inspection section is dependent on the particular situation and conditions under which it must operate. Inspecting personnel are also used to perform command maintenance inspections as directed by higher headquarters (AR 750-8).
- (2) *Functions.* The inspection section will—
 - (a) Perform initial and final (technical) inspections of all ordnance equipment entering and leaving the maintenance shops.

- (b) Indicate, on each job order, the work required and the estimated time required for repair.
- (c) Determine parts requirements as a result of the initial inspections, and assist shop personnel in determining any additional parts required after repairs are underway.
- (d) Perform acceptance inspections on end items being received by the supply section. This is usually limited to an inspection for missing parts and evidence of abuse.
- (e) Perform in-process inspections as directed by the commander to assure that work is being performed properly and to identify areas in which operations can be improved.

(3) *Types of inspections.*

(a) *Initial.*

1. Materiel received in ordnance shops must be thoroughly inspected to determine whether each particular piece of equipment is reparable at that level or whether it must be further evacuated or salvaged. If an item is to be repaired, all essential repairs are specified on the job order by the inspector. The inspector decides whether defective components or assemblies will be replaced or repaired. The factors affecting this determination are the time and equipment necessary for each operation, and the availability of repair parts.
2. Inspectors must be alert to the supply situation and base their decisions upon the availability of repair parts. The shop officer may change the inspector's decisions to repair rather than replace components in assemblies, or vice versa, when it becomes apparent that such a change will expedite the repair of an item without lowering the quality of the product. In ordering parts for a job, it is better that the inspector overestimate the parts needed, rather than to underestimate and have repairs delayed for a lack of parts while the job is in process. Even with the use

of the most proficient inspectors, there will be instances when the requirement for some parts will not be known until repairs are in progress. Overordering should be controlled, however, to avoid not only the unjustified replacement of serviceable parts, but also the loss of effort incurred in the returning of unrequired parts to company supply stocks and the returning of excess stocks to supply units.

- (b) *In-process.* Emphasizing in-process inspections will significantly reduce the number of rejections by the final inspectors. It is often easier to detect deficiencies while the repair of equipment is in progress than to find them after the work has been completed. Often, when equipment is dismantled, deficiencies can be noted which may not be detected at any other time. Shop foremen and section chiefs are charged with the primary responsibility for performing in-process inspections, but they may be assisted by personnel of the company inspection section. A high percentage of final inspection rejections indicates the need for improving in-process inspections.

- (c) *Final.* Every piece of ordnance materiel must be inspected prior to its release from an ordnance maintenance shop. The final inspection is the commander's means of controlling the quality of the work. It is not the duty of the inspectors to make repairs or adjustments to equipment during the final inspection. Defective equipment should be returned to the responsible shop for correction of any deficiencies. The final inspection will consist of a complete technical inspection, with emphasis on the work performed by the shop. Whenever possible, the initial and final inspections of any particular piece of equipment should be performed by different inspectors. Appendix IV lists forms used in these inspections.

CHAPTER 4

SUPPLY

Section I. GENERAL

23. Introduction

a. General. The ordnance supply system in a theater of operations is composed of three elements: direct, general, and depot support supply. At direct support level the functions of supply are combined with maintenance. Direct support supply operations are covered in FM 9-3. General and depot support supply operations exist to provide the reservoir of class II items needed to insure the continuous flow of ordnance equipment, repair parts, and supplies required by using units and ordnance maintenance units. Units and activities performing these supply operations have no maintenance mission other than a limited amount of in-storage maintenance on supplies stocked and organizational maintenance on unit equipment.

b. Objectives. The ordnance supply system has been established to—

- (1) Insure a steady flow of fast-moving components, assemblies, parts, and operating supplies to all echelons of maintenance in the theater.
- (2) Assure the delivery of these supplies to locations convenient to the users.
- (3) Replace unserviceable end items promptly by like serviceable items when repairs may be unduly delayed.
- (4) Provide a system for transmitting the consumer's requirements for supplies to the particular activity which is able to satisfy the demands.
- (5) Disperse stocks throughout the theater.
- (6) Store frequently required items as close as practicable to the sources of demand.

24. Organization for General Support Supply

a. Ordnance general support supply activities

are operated by field supply companies and park companies. The field supply companies carry the stocks of repair parts and end items (less vehicles and artillery) required by using units and ordnance maintenance units. The park companies receive, store, and issue wheel and track vehicles and artillery. Both types of units carry stocks which are tailored to meet the demands generated by the particular types and quantities of equipment located within a geographical area of responsibility. Both units are semimobile and are able to relocate periodically to support the ordnance maintenance units in a fluid situation. The stocks carried are designed to satisfy daily requirements and to provide for fluctuations in demands and deliveries. Stock levels are established by competent authority and are quoted in terms of numbers of "days of supply." A "day of supply" is the estimated quantity of supplies required for one day's operation and is the basis for stockage objectives under the Army Field Stock Control System. The stock in these units constitutes a portion of the theater reserve of ordnance class II and IV stocks.

b. Field supply companies and park companies operate in both the COMMZ and the combat zone. They can perform a general support supply mission in either location. Those in the COMMZ operate under the technical supervision of the theater army logistical command ordnance officer; those in the combat zone under the technical control of a field army ordnance officer. They are normally incorporated into battalions which may consist entirely of supply units or which may also contain maintenance units. The composition of each battalion will be determined primarily by the quantity of equipment to be supported and the nature of the geographical area in which the equipment is located.

- (1) The capability of the ordnance field supply company is limited to receiving, storing, and issuing supplies, and maintaining the records necessary to insure prompt restocking of items and accurate accounting for stocks on hand. The company is designed to operate independently, but is flexible enough to become an element of a larger supply organization such as a consolidated ordnance supply depot.
- (2) The ordnance park company is designed to operate without fixed facilities, but it must have good hardstand on which to store its stock of vehicles and artillery. Its capabilities include the means of receiving, storing, and issuing vehicles and artillery, and maintaining necessary stock records. The company can operate independently, but it is normally incorporated into a battalion which also contains maintenance units to provide necessary maintenance support and to prepare the equipment for issue. Park companies are usually located in field army service areas and in the COMMZ.

25. Organization for Depot Support Supply

Depot support supply activities are operated by ordnance supply depot companies, ordnance park companies, and, on occasion, by ordnance field supply companies. The companies are designed to operate independently. However, when two or more companies are used to operate a depot, the operations of the companies are controlled by a depot headquarters. Under these circumstances, the companies ship materiel on orders from the depot control office and have little or no control over the types or quantities of items they stock.

a. The ordnance supply depot company is designed to operate in relatively fixed locations. Its organization and equipment is such that it operates most efficiently when handling large quantities of bulk supplies. It will normally perform only a depot support mission, but it is capable of performing a general support mission when the situation warrants.

b. The ordnance field supply company, when assigned a depot supply mission, will operate

in a manner similar to a depot company. When so employed, the company should be issued materials handling equipment to increase its capacity.

c. The ordnance park company operates in much the same manner, whether in a general or depot support role. Usually the park company, when performing a depot mission, is incorporated into a battalion containing supply companies. Because it is quite probable that several park companies will be utilized in the COMMZ, park companies may be commodity loaded, security permitting.

d. The ordnance stock control detachment is used to operate a theater stock control or central inventory control point.

26. Demands and Requirements

a. The ordnance class II supply system is built on a foundation of demands. Demands are requests for supplies made by consumers (using units and ordnance maintenance shops) and are submitted at the points where materiel leaves ordnance supply channels. Each demand creates a requirement which must be satisfied by the supply system.

b. The individual demand may be satisfied at any level of supply by the issue of the item. In satisfying the demand from stock or accepting a demand for an item not in stock, the supplying agency creates a need for an item which will appear to its supplying agency as a requirement. Therefore, the requirement for the item still exists. This requirement can be satisfied only by introducing into supply channels a new or replacement item or the repair parts necessary to repair an unserviceable item. Direct support companies consolidate their internally generated demands with those received from using units. These totals then become direct support requirements and are transmitted to general support supply units. Demands also originate in general and depot support maintenance units and are transmitted to supply units. The total requirements received by the general support supply units, when consolidated with depot requirements generated by changes in the depot stockage authorization, constitute the total theater requirements which are forwarded to the theater central inventory control point.

This agency will take action to satisfy the requirements by obtaining materiel from CONUS or through local procurement. (AR 725-950 covers local purchase of ordnance expendable items. SR 715-110-50 establishes procedures governing local purchase of supplies and materiel for which the Ordnance Corps is assigned logistical responsibility. The methods of purchase are prescribed in Armed Forces Procurement Regulations, Army Procurement Procedures, and Ordnance Procurement Instructions.)

27. Flow of Supplies

The channels utilized for the flow of class II supplies are determined by requirements and the nature of the items.

a. Supplies for the replenishment of authorized stocks travel by normal transportation means from CONUS through theater terminals

to base depots near the terminals. From these depots, supplies flow to general support supply units, either directly or through distribution depots in forward areas. From these general support supply units the supplies flow to general support maintenance units and direct support units. Supplies may flow directly from a base or distribution depot to maintenance units if the depot has a general support supply mission.

b. Supplies of stockage items for which a demand exists, but which are out of stock, will be shipped from the nearest supply agency which has the items in stock directly to the requesting ordnance unit by most expeditious means.

c. Fringe items (par. 28c) will be shipped from the next higher level supply activity authorized to stock the items directly to the requesting ordnance unit. Shipment will be made by the fastest transportation available.

Section II. SUPPLY MANAGEMENT

28. Authorized Stockage

a. Authorized items which meet demand criteria are placed on stockage lists (AR 711-16). Items for which an anticipated requirement exists are placed on stockage lists as standby items. Stockage lists contain items authorized to be stocked at supply agencies.

b. The stockage list at each agency is based on a consolidation of requirements from supported ordnance class II supply units, and consequently is normally larger than the lists of any of the supported ordnance units. This follows the principle of "fast-moving items forward and slow-moving items to the rear." When the number of demands for an item meets established criteria, the item is added to the list; when the demand falls below an established point, the item is removed from the list. In all cases, an item that is authorized for stockage at a supply agency must be on the stockage lists of all supporting agencies higher in the supply channel.

c. An item which is authorized for issue by a Department of the Army supply publication but which does not qualify for stockage at a particular supply agency is a "fringe" item at

that agency. It may be requested when needed for immediate use.

29. Stock Control

Effective operation of the ordnance supply system requires close and continuous control of supply transactions at all levels of supply. AR 711-16 (Installation Stock Control and Supply Procedures) contains the basic stock control policies and accounting procedures for supplies in a theater of operations. The objective of the system is to assure an adequate amount of supplies at the proper places and at the proper time, without overstocking at any point of supply.

a. *Field Army.* In each field army, stocks in general support supply units are controlled by a central stock control agency. Ordnance stocks are under the control of the field army ordnance officer. Requests for supplies from direct support units and general support maintenance units are transmitted to the central stock control agency. Electronic data transmission systems are utilized to the maximum practicable degree. In the event the electronic system fails, requests will be transmitted by the next fastest means. The central stock control agency satisfies the requests by—

- (1) Directing shipment from the field supply company located closest to the requester.
- (2) Transmitting requests to the COMMZ control agency (central inventory control point) for those items which are not in field army stocks.

The field army central stock control agency makes additions to and deletions from the stockage lists of each ordnance unit assigned to the field army.

b. Communications Zone.

- (1) In the COMMZ, control of stocks in all general and depot supply units is vested in a central control agency which is under the operational control of the theater army logistical command ordnance officer. (The establishment, organization, and operations of logistical commands is covered in FM 100-10.) This control agency is usually established as a theater central inventory control point (AR 700-5 and FM 54-1).
- (2) A theater central inventory control point performs stock control functions and maintains records on regulated items. The theater central inventory control point controls the flow of stocks within the COMMZ and into the field army areas. Requests originating in field armies and the COMMZ general and depot support maintenance units and direct support units are transmitted to the theater central inventory control point. This agency directs shipments from COMMZ sup-

ply installations to fill requests, or transmits the requirements for items which are not in theater stocks to CONUS. The theater central inventory control point makes additions to and deletions from authorized stockage lists of the field armies and all supply and maintenance units in the COMMZ.

- (3) Duplicate records should be maintained in separate locations to insure continuity of operations in the event of destruction of the central inventory control point.

30. Control of Supplies

Many items in the supply system, because of their value, size, and essentiality to combat success, or because they are in short supply, cannot be distributed on an "as requested" basis. These items are subject to special control, which is a command function, and are called regulated items. Regardless of where the regulated items are located in the system, no issue may be made without approval by the appropriate commander. The items are subject to normal stock control which maintains records of quantities and locations. Accurate stock control is essential to efficient control of supplies. Current lists of regulated items must be distributed to all ordnance maintenance and supply agencies. The list of regulated items must be reviewed frequently so that only those items which must be regulated remain on the list. Normally, commanders delegate the control of most of the regulated items to the ordnance officers on their staffs.

CHAPTER 5

EVACUATION

Section I. GENERAL

31. Purpose

Most of the ordnance class II items in a theater will eventually be evacuated to a collecting point maintenance unit in a rear area where a high percentage can be either repaired or reclaimed. This operation is an important means of replenishing theater stock and is the primary source of slow-moving parts. The location of collecting points is an important factor in the operation of an evacuation system. They should be located to take full advantage of road and railroad nets.

32. Responsibility

Each commander is responsible for evacuating unserviceable ordnance materiel to a designated ordnance unit as expeditiously as possible. Evacuation policies are established by each major command. Ordnance commanders must insure that sufficient qualified technicians; particularly competent inspectors, are assigned to the evacuation function. The Transportation Corps is responsible for transporting unserviceable materiel within ordnance evacuation channels.

33. Controls

The flow of unserviceable materiel must be controlled from the time it enters evacuation channels until final disposition is accomplished. Because of the importance of the evacuation system to theater supply, and because the materiel flows between major commands, the theater ordnance officer must actively control the ordnance evacuation operation. To do this he establishes the theater evacuation policies. Subordinate ordnance commanders establish detailed standards and procedures, based on theater policies, so that each organization that is responsible for processing unserviceable mate-

riel is furnished definite condition standards and disposition instructions. The success of the evacuation system depends largely on the instructions supplied to the maintenance companies and collecting points by ordnance commanders (app. III). These instructions must be complete, timely, and based on the principle that all unnecessary handling be eliminated. If proper evacuation instructions have been issued by higher headquarters, the type and condition classification of each item will determine its destination.

34. Collecting Points

a. Ordnance collecting points are facilities to which U. S. and foreign ordnance materiel is evacuated for repair, reclamation, or further evacuation. Ordnance collecting points are located where required in corps and field army service areas and in the COMMZ.

b. An ordnance collecting point performs the following functions:

- (1) Receives, inspects, classifies, and segregates unserviceable and abandoned U. S. and foreign class II materiel.
- (2) Preserves and packages, as necessary to preclude further damage to evacuated materiel during shipment.
- (3) Sends repairable items to designated maintenance units for repair.
- (4) Ships to appropriate shipping terminals, those items designated for evacuation to CONUS.
- (5) Evacuate foreign materiel as directed by technical intelligence.
- (6) Reclaims serviceable and repairable components from uneconomically repairable end items as required or directed.

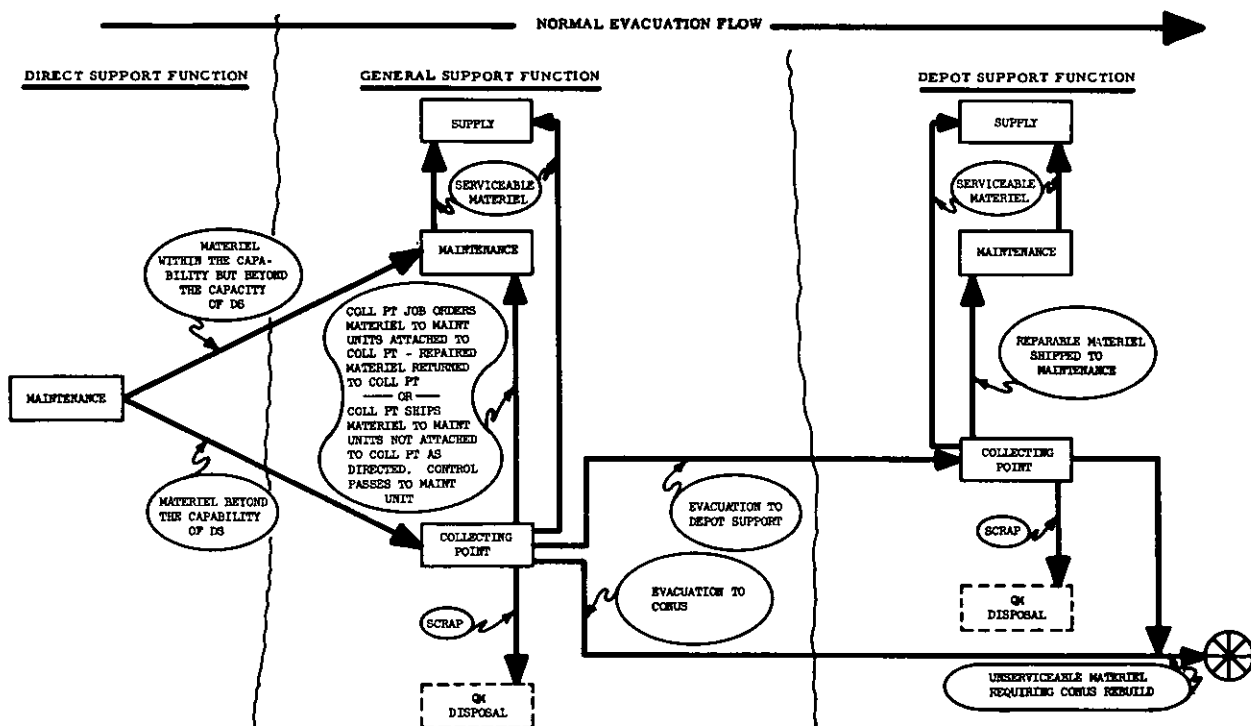


Figure 4. Ordnance evacuation flow, class II and IV (less guided missiles).

- (7) Returns serviceable ordnance items to supply channels.
- (8) Disposes of the residue of unserviceable materiel to a quartermaster salvage and disposal point, or as otherwise directed.

c. General support is the lowest level at which units are assigned the evacuation function as a primary mission. The ordnance recovery and classification company is specifically designed to operate an ordnance collecting point in the field army service area. The ordnance collecting point company performs this function in the communications zone. One or more maintenance units are usually assigned the mission of providing maintenance support to the collecting point. When recovery and classification companies or collecting point companies are not available or when the workload does not warrant their use, general support maintenance units may operate collecting points.

d. Class II items of guided missile weapons systems are handled in two separate evacuation channels. Those items of a conventional automotive or mechanical nature are evacuated through normal evacuation channels as shown in figure 4. The other items are evacuated through guided missile class II maintenance channels. Guided missile direct support units will evacuate these unserviceable class II items to guided missile general support maintenance companies, which may further evacuate the items to other guided missile general support maintenance companies or to a guided missile maintenance depot in the theater of operations or zone of interior. In a theater, guided missile maintenance depots are operated by guided missile general support units which may be augmented by civilian labor, security considerations permitting.

Section II. OPERATIONS

35. Evacuation Procedures

The evacuation process starts with the receipt of unserviceable, abandoned, or captured ordnance materiel by ordnance direct support units. The unit possessing the materiel is responsible for delivering it to ordnance direct support. Evacuation of foreign ordnance materiel will be as directed by technical intelligence instructions. U. S. materiel is inspected by the direct support unit and, on the basis of the inspection, is classified for repair at direct support level or evacuation. Irreparable items having no reclamation value may be disposed of by the direct support units. Items not repaired at direct support are evacuated to general support in accordance with established evacuation procedures. General support evacuation operations may be either centralized or decentralized, or may be operated as a combination of the two systems. In any system, certain general procedures will be followed. Evacuated materiel received by general support will be inspected and classified for repair, reclamation, or further evacuation. All decisions to repair, reclaim, or evacuate will be guided by lists of needed items prepared by supply activities, and by other disposition instructions furnished by higher headquarters.

a. Repair. Materiel classified for repair will be repaired by a general support maintenance activity. The serviceable materiel produced by these maintenance activities will be returned to supply channels.

b. Reclamation. Materiel classified for reclamation is dismantled as necessary. Needed serviceable parts are returned to supply channels. Repairable parts that are needed by supply are handled as stated above and the remainder is disposed of through quartermaster salvage and disposal points.

c. Evacuation. Items classified for further evacuation are packed, crated, or preserved only to the extent necessary to protect them against further damage during transit. Packing and preserving capabilities of general support units will vary, depending upon the availability of packing materials. Packing materials received with serviceable supplies are the best source of packing for unserviceable items, and command

supervision is necessary to prevent these materials from being diverted to other uses. Items to be evacuated are shipped from a collecting point, by Transportation Corps facilities, to the destinations indicated by the evacuation instructions published by the command.

d. Inspection. Whenever unserviceable U. S. materiel is evacuated from one ordnance unit or support level to another, the technical inspection report must accompany each end item. The losing unit is responsible for furnishing such technical inspection reports to the gaining ordnance organization. When equipment is received without such reports, the gaining unit should not delay the evacuation of the item longer than necessary to complete the technical inspection. In cases of the repeated failure of units to forward technical inspection reports with evacuated equipment, such remissness should be corrected through liaison with the offending organization, or by official report, when necessary. Although inspection reports should, in general, be as complete as possible, limited technical inspections may be permitted, subject to local ordnance command policy, in the case of equipment meeting certain unserviceability criteria. The purpose of such an arrangement is to relieve a unit of an unnecessary inspection workload when it is apparent that the damaged end item cannot be restored to service, or when the nature of damage will necessitate an inspection at a higher maintenance echelon. In all cases, however, the technical inspection will be sufficiently detailed to facilitate appropriate evacuation action on the affected end item.

36. Evacuation Systems Utilized in the Combat Zone

The evacuation system developed for a particular situation will be influenced by many considerations. It is quite probable that neither a purely centralized nor a purely decentralized operation will be completely satisfactory under any given set of conditions. The two types of operations are discussed separately, however, so that the principal advantages of each can be delineated and a system devised which will be most suitable for each situation.

a. Centralized Operations. The collecting

point is the key to the centralized operations system. Within specified geographical areas, each collecting point controls and directs the movement of all evacuated materiel received from direct support. Normally, the collecting points in field armies are operated by recovery and classification companies. All general support maintenance units within each area are assigned the mission of supporting a collecting point. Evacuated materiel received at a collecting point from direct support units is inspected and classified for repair, reclamation, or further evacuation. Materiel to be repaired is sent to the maintenance companies on job orders. When the work is completed, the items are returned to supply channels as directed by the collecting point. When authorized by the field army commanders, serviceable end items may be retained by the collecting point to serve as maintenance exchange stock. All serviceable repair parts and those serviceable end items not required for maintenance exchange stock are returned to supply channels. Materiel to be reclaimed is dismantled at the collecting point. The needed reparable parts are sent to the maintenance companies, as described above; serviceable items are placed in supply channels; and irreparable parts and those reparable parts which are not needed are disposed of through a quartermaster salvage and disposal point. Items classified for further evacuation are preserved and packed by the collecting point and shipped directly to their final destinations in accordance with published evacuation instructions.

b. Advantages of Centralized Operations.

- (1) All records of serviceable and unserviceable items are maintained at a central location.
- (2) Uniform serviceability standards can be more easily enforced.
- (3) Workloads among maintenance units can be balanced.
- (4) Maintenance units may be commodity loaded, particularly for low density items. Commodity loading leads to more efficient operations because repair personnel become more proficient when specialized, and stocks of repair parts may be used more effectively.

- (5) Maintenance units receive only the items on which they will perform repairs. They are not required to act as intermediate points in the evacuation channel.
- (6) Most of the packing and crating is done by the company operating the collecting point, thereby relieving the maintenance units of this function.
- (7) Transportation requirements are reduced through consolidation of loads.
- (8) More effective liaison can be effected between maintenance and supply, particularly in regard to critical items and repair priorities.

c. Decentralized Operations. When evacuation operations are decentralized, materiel which is determined by direct support (in accordance with established standards) to be within the capability of general support is evacuated to designated general support maintenance units. Materiel which has only reclamation value or which is beyond general support repair capability is evacuated by direct support to a general support collecting point. Each general support maintenance unit repairs the materiel it receives and returns it to supply channels. Items found to be beyond the capability of the maintenance units are evacuated to the collecting point. The collecting point, operated by a recovery and classification company, performs reclamation operations on uneconomically reparable items, and evacuates items requiring depot maintenance to appropriate facilities in the theater or in CONUS. The collecting point controls only the flow of that materiel which it receives. Materiel received at the collecting point will be inspected and classified into two categories: for reclamation, or for further evacuation to depot support in the COMMZ or CONUS. Items classified for reclamation will have the reparable components and assemblies removed. The residue will be disposed of in accordance with quartermaster instructions. Reparable components and assemblies will be sent to general support maintenance units for repair. After repair, they are placed in supply channels.

d. Advantages of Decentralized Control.

- (1) Permits dispersal of general support maintenance units.

- (2) Enables these units to displace in order to stay close to direct support units independently of other general support units.
- (3) Routes a majority of general support repair jobs directly to the maintenance unit that will perform the repairs.

e. Fast-Moving Versus Static Situations. Each evacuation system has advantages and disadvantages which are adaptable to particular situations. In fast-moving situations such as in the initial phase of an invasion, during intensive combat in an established theater, or when the frontline units are displacing rapidly, the operation should be decentralized. In static situations such as operation in the rear areas of an established theater, in inactive theaters serving as a base of operations, or during peacetime, centralized operation is considered more efficient.

37. Typical Theater Evacuation System

Figure 4 illustrates a typical application combining centralized and decentralized operations. It is a compromise to eliminate undesirable features of the two systems. In a centralized operation many items that could be evacuated directly to a maintenance unit are handled by the collecting point, and in a decentralized operation many of the items that are evacuated to maintenance units must be further evacuated to the collecting point. The compromise system attempts to overcome these undesirable features. In this solution, general support is organized as depicted in figure 4. In each area in a field army, the evacuation function is performed by a battalion composed of a recovery and classification company and maintenance companies (fig. 2). Items being evacuated by direct support are classified into two categories: those which are beyond the capability of direct support, and those which are within the capability of direct support but beyond the capacity of the direct support unit at that time.

a. When the items which are beyond the capability of direct support arrive at the collecting point, a decision is made as to whether the item is within the repair capability of general support maintenance. Thus, the decision as to

the capability of the general support maintenance unit is made by the collecting point, and not by the direct support unit. Items that are classified to be repaired at general support level will be job ordered to the maintenance units of the collection and classification battalion. When the capacity of these units is exceeded, the work will be shipped to units of the general support maintenance battalion in the area. If these units are working at full capacity, work may be evacuated to maintenance facilities in the rear.

b. Items within the capability but beyond the capacity of direct support will be evacuated by direct support directly to the general support maintenance battalion. The fact that the items have been determined to be within the capability of the direct support unit assure that their repair is within the capability of the general support maintenance unit, and no further evacuation should be necessary.

c. When a maintenance depot in the COMMZ is established using a combination of general support maintenance units, a collecting point may be employed as part of the maintenance depot. If the volume of evacuated material justifies it, separate collecting point battalions, each composed of a collecting point company and one or more maintenance companies, may be established. In these instances, the collecting point company (app. II) operates a collecting point which is the receiving agency for the maintenance depot. All unserviceable materiel evacuated to the maintenance depot from the field army, or from direct or general support in the COMMZ is received by the collecting point. Here it is classified as repairable or irreparable. The irreparable materiel is disposed of through quartermaster channels. The repairable materiel is reported and held in the collecting point until orders are received to send it to one of the maintenance shops. Scrap generated in the maintenance shops is accumulated at the collecting point for ultimate shipment to the quartermaster salvage and disposal point.

d. The collecting point company is designed to operate in the COMMZ. This company can operate two collecting points. The company has no recovery function and a limited evacuation

function; consequently, it is smaller in size and has less heavy equipment than the recovery and classification company. The collecting point company is responsible for the receipt, classifica-

tion, disassembly, preservation, and disposition, as directed, of ordnance materiel received from COMMZ maintenance channels or collecting points in the field army area.

CHAPTER 6

SUPPORT OF GUIDED MISSILE SYSTEMS

38. Introduction

a. The method established for providing general and depot support for class II items of a guided missile weapons system very closely resembles the system which supports other items of ordnance class II materiel. Throughout this chapter, the term "missile" will include all missiles and heavy rockets except intermediate range and intercontinental ballistic missiles.

- (1) For the most part, class II missile repair parts, assemblies, and components are distributed through the same system of depots as conventional class II items. Replacements for specialized vehicles associated with missile systems may be stored and issued through maintenance channels on a maintenance exchange basis. The bulk of the reserve of these specialized vehicles will be stocked at ordnance parks along with other ordnance vehicles and artillery.
- (2) General support maintenance of all guided missile class II items, except those of a purely mechanical or automotive nature, is normally performed by the Ordnance Guided Missile General Support Company, TOE 9-227, augmented, if necessary, by appropriate TOE 9-500 units. When the missile density is such that the use of a company is not justified, general support maintenance may be performed by cellular units provided by TOE 9-500. These cellular units are attached to ordnance maintenance companies for administrative, mess, supply, and allied trades support.
- (3) Maintenance of vehicles and purely mechanical items is performed by ord-

nance general support, general automotive support, and tire repair companies.

b. The nature of guided missiles and guided missile materiel results in the creation, to some degree, of overlapping responsibilities between units providing class II maintenance support and those responsible for class V maintenance. The supply of class V items cannot be divorced from class II supply since class V items contain class II components. Consequently, the responsibilities, functions, and capabilities of general support units providing missile maintenance and supply support differ, in some respects, from those of their counterparts providing general and depot support for other items of ordnance class II materiel. For example, ammunition installations must be provided with certain class II items to enable them to perform class V maintenance, and guided missile general support maintenance units, in addition to accomplishing overflow work from lower class II maintenance echelons, also receive unserviceable missile bodies from class V installations or units for repair. Chapter 4 of FM 9-1 and chapter 5 of FM 9-3 contain additional information on this subject.

c. The supply of ammunition end items for guided missile systems (including complete missiles, associated warheads, and propellants) and the maintenance of these items (less class II components and assemblies of the missile body) is a class V function performed by special weapons and missile companies. These aspects of supply and maintenance are discussed only so far as they affect class II maintenance and supply operations. For information on class V supply and maintenance, see FM 9-5.

39. Supply

a. General.

- (1) Guided missile general supplies are

those ordnance items not classed as explosive components or directly allied with explosive components. This includes the repair parts, assemblies, and components for guided missile bodies, and for launching, handling, guidance, and testing equipment. Class II supply units are responsible for providing the class II items needed in the maintenance of nonexplosive class V missile components, and for obtaining the necessary class II repair parts which are the responsibility of other technical services (for example, electronic tubes from Signal Corps supply units).

- (2) To attain the most expeditious supply action on repair parts needed to return missile systems to serviceable condition, "Blue Streak" requisitions may be used. Such requisitions are accorded the highest priority in processing, communications, and delivery.

b. Distribution System (fig. 5).

- (1) Within the combat zone, the guided missile direct support unit is charged with issuing replacement items of class II missile materiel to the firing unit. Replacement repair parts, components, and assemblies needed to replenish direct support stocks are provided by an ordnance field supply company. This company will also provide the class II items needed by class V activities in the performance of their maintenance functions. Field supply company stocks are replenished by class II supply depots (main army depots) operated by other field supply companies, or by direct shipment from class II depots in the communications zone.
- (2) Guided missile maintenance units operating in the field army service area will receive their class II supplies from the field army class II depot (main army depot). The class II requirements of class V guided missile maintenance activities will be satisfied in a like manner.
- (3) Base depots in the COMMZ serve as a base of supply for the theater. As the depth of the theater increases, addi-

tional depots may be established in more forward areas of the COMMZ. These class II depots, operated by the Ordnance Supply Depot Company, TOE 9-367, replenish the stocks of depots in the field army area and issue class II items to the guided missile maintenance units located in the COMMZ.

c. Supply Procedures.

- (1) *General.* The storage, issue, and control of class II guided missile materiel differs little from similar procedures established for other items of ordnance class II materiel. In fact, at general and depot support levels these functions are performed by the same supply units for all class II ordnance items. For further information on general and depot support supply operations, see chapter 4.
- (2) *Stock control.* Basic stock control and reporting procedures are contained in AR 711-16. Additional reports may be required by the theater central inventory control point.
- (3) *Depot stockage.* Class II items of missile materiel are handled in the same manner as other class II items. Repair parts may be concentrated in a single COMMZ depot, security considerations permitting. Items will not be prepared for issue at this echelon, and only a minimum of in-storage maintenance will be required.
- (4) *Control of end items.* End items of guided missile materiel will be controlled at all times. In the combat zone, this control will be exercised by the field army ordnance officer for the field army commander. Subject to availability of stock replacement, a quantity of end items will be stocked in direct support maintenance units for maintenance exchange purposes. The bulk of the reserve of rolling type guided missile end items will be normally stocked in ordnance parks.

40. Maintenance and Evacuation

a. General.

- (1) Because of the need for rigid controls,

the critical need and relatively low density of certain items, and the requirement for special handling and transportation, no separate channel has been established for the evacuation of unserviceable items of guided missile materiel (less automotive and mechanical items). Instead, items are successively evacuated rearward through maintenance facilities until disposition is made of the items.

- (2) Unserviceable items evacuated to general support maintenance units stem from two sources: guided missile firing units and ammunition installations. In either case, evacuated items include unserviceable missile bodies or unserviceable class II assemblies and components which are beyond the repair capacity or capability of the direct support organization responsible for class II missile maintenance support.
- (3) Unserviceable items which are beyond the repair *capacity* of the general support units are evacuated to other general support maintenance units farther to the rear. Unserviceable items which are beyond the repair *capability* of general support are reported to the theater central inventory control point. This agency will direct shipment to a terminal facility for evacuation to the zone of interior, or will provide other disposition instructions. (A diagram of the maintenance and evacuation of nonexplosive guided missile components and assemblies is shown in figure 6. Figure 7 depicts the maintenance and evacuation of missile bodies.)
- (4) Unserviceable items which have been returned to serviceability are returned to supply channels as soon as repairs are accomplished. Missile bodies are returned to the nearest special ammunition supply point (SASP) where they once again resume their class V identity. Other repaired items of guided missile materiel are returned to class II supply channels.

b. General Support Maintenance Units.

(1) General.

- (a) General support maintenance service for class II items of guided missile materiel (less automotive or mechanical items) is provided by cellular units or companies. The cellular units provided by TOE 9-500 are used in situations where the missile density does not warrant use of a larger unit. These cellular units may also be used to augment the capability of the ordnance guided missile general support company.
- (b) The capabilities of guided missile general support maintenance units, as compared to direct support units, are based on volume and time, since skills and tool sets for direct support are practically equivalent to those found in general support units.

(2) Ordnance guided missile general support company.

- (a) This company provides general support for the guided missile bodies and for nonexplosive components of specific missile systems, including all ordnance materiel of the ground guidance, launching, and handling equipment not allied with automotive or conventional mechanical equipment. It is assigned to the field army or COMMZ, and is the highest echelon of missile maintenance within a theater.
- (b) The organization of the company includes commodity-specialized maintenance platoons, each specializing in the support of a specific missile system. Each of the platoons is organized into several operating sections. Administrative, control, and supply functions for the company are accomplished by the company headquarters, operations, and supply sections. The formation of this company into commodity groupings provides a flexible organization which can be expanded to accommodate additional cellular type detach-

- ① UNSERVICEABLE NONEXPLOSIVE GUIDED MISSILE REPAIR PARTS, COMPONENTS, AND ASSEMBLIES REQUIRING MAINTENANCE BEYOND THE CAPABILITY OF USING UNIT OR DIRECT SUPPORT DETACHMENT ARE TURNED IN BY THE USING UNIT ON A DIRECT EXCHANGE BASIS.
- ② PERFORMS DIRECT SUPPORT MAINTENANCE FOR USING UNIT. ALSO PROVIDES TECHNICAL ASSISTANCE SERVICE AND MOBILE REPAIR CREWS FOR WORK IN THE OPERATIONAL AREA. THIS CELL IS NORMALLY UNDER THE OPERATIONAL CONTROL OF A MAINTENANCE AND SUPPLY BATTALION, TOE 9-76.
- ③ EXCESS SERVICEABLE NONEXPLOSIVE GUIDED MISSILE REPAIR PARTS, COMPONENTS, AND ASSEMBLIES ARE TURNED IN TO SUPPORTING SUPPLY UNIT.
- ④ UNSERVICEABLE GUIDED MISSILE REPAIR PARTS, COMPONENTS, AND ASSEMBLIES REQUIRING MAINTENANCE BEYOND THE CAPABILITY OF THE DIRECT SUPPORT DETACHMENT ARE EVACUATED TO SUPPORTING GUIDED MISSILE GENERAL SUPPORT COMPANY.
- ⑤ PROVIDES GENERAL SUPPORT MAINTENANCE. RETURNS REPAIRED COMPONENTS, ASSEMBLIES, AND END ITEMS TO SUPPLY CHANNELS. TECHNICAL ASSISTANCE SERVICE WILL BE PROVIDED TO AUGMENT THE CAPABILITY OF DIRECT SUPPORT DETACHMENTS.
- ⑥ REPAIRED AND EXCESS GUIDED MISSILE REPAIR PARTS, COMPONENTS, AND ASSEMBLIES ARE RETURNED TO STOCK.
- ⑦ UNSERVICEABLE NONEXPLOSIVE GUIDED MISSILE REPAIR PARTS, COMPONENTS, AND ASSEMBLIES REQUIRING MAINTENANCE BEYOND THE CAPABILITY OF GUIDED MISSILE GENERAL SUPPORT COMPANIES WILL BE REPORTED TO THEATER CENTRAL CONTROL POINT (ORDNANCE CLASS II AND IV) FOR DISPOSITION INSTRUCTIONS. THESE UNSERVICEABLE ITEMS MAY BE SALVAGED OR EVACUATED TO A TERMINAL FACILITY FOR SHIPMENT TO THE ZONE OF INTERIOR.

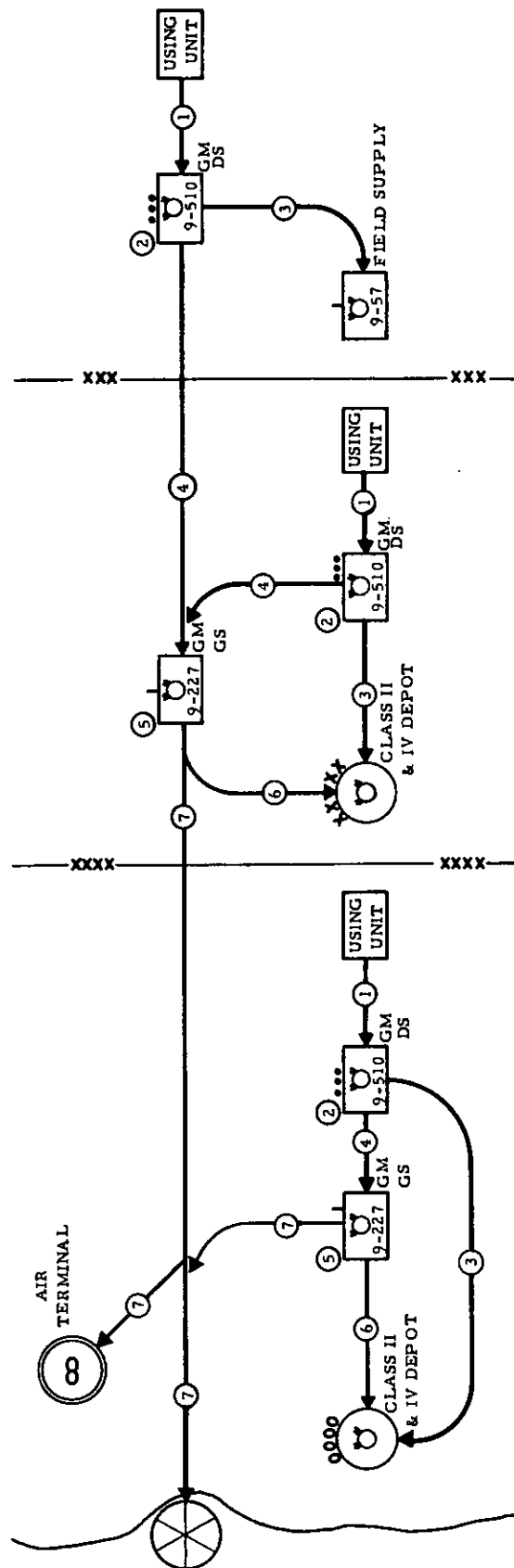


Figure 6. Maintenance and evacuation of nonexplosive guided missile repair parts.

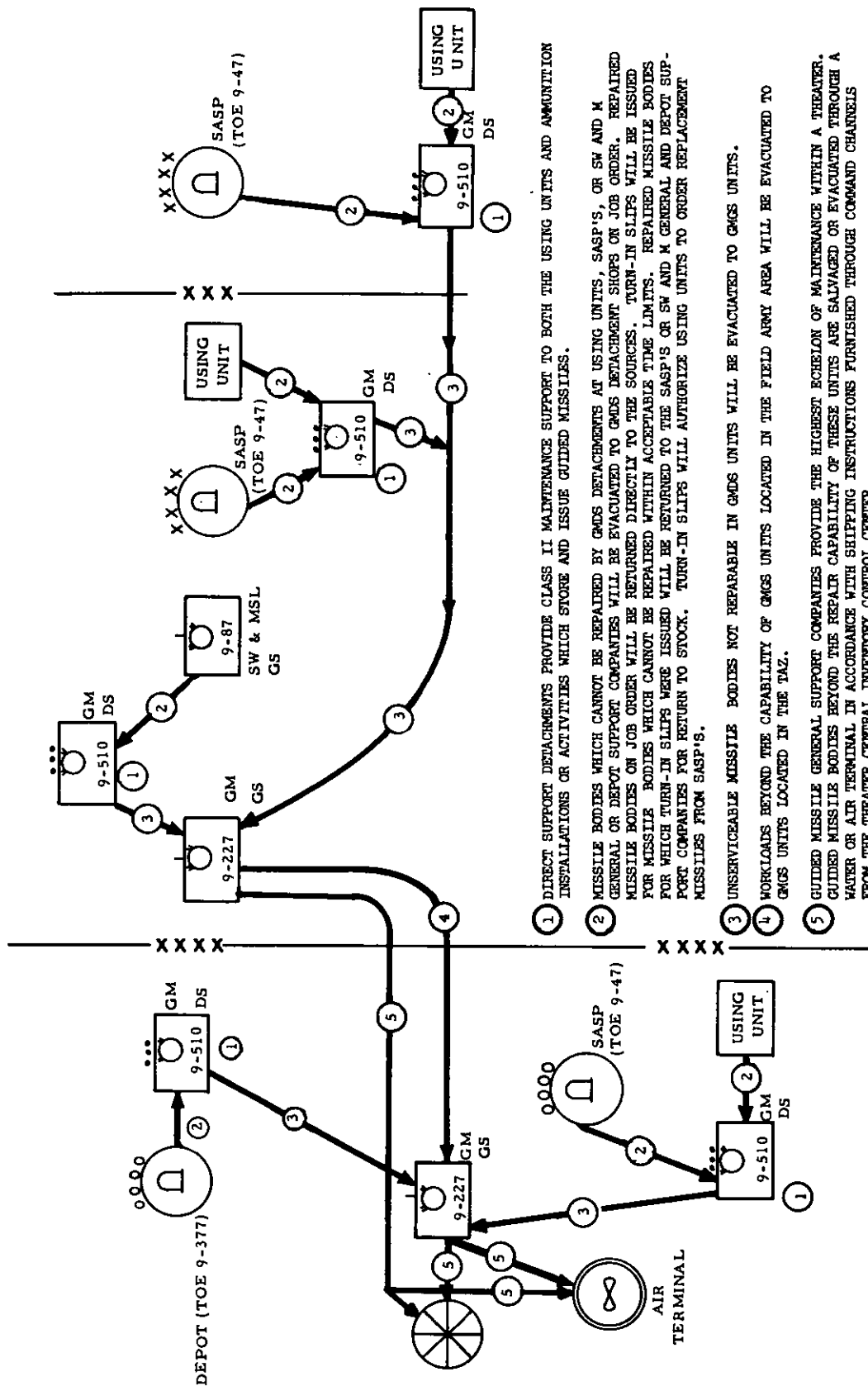


Figure 7. Maintenance and evacuation of guided missile bodies (explosive components and propellants removed).

ments to increase its capabilities and capacity. For additional information on capabilities and organization, see TOE 9-227.

- (c) The company normally does not have direct contact with using units, and

supply support is provided for the company shops only.

- (d) This unit will provide status reports on missile bodies on hand as directed by the controlling higher headquarters.

CHAPTER 7

TACTICAL AND ADMINISTRATIVE OPERATIONS

Section I. GENERAL

41. Introduction

There are many factors which directly affect the accomplishment of a unit's technical mission. Of particular significance are the requirements for efficient and effective administration and the necessity for adequate preparation and proper implementation of plans for tactical operations. The tactical and administrative operations necessary to facilitate operations of general and depot support units include, but are not limited to, administration, movement, security, area defense, site selection, area damage control, and area layout. Many of the features of these operations become routine, either by their nature or because the commander wishes to make them so. Therefore, the preparation of standing operating procedures (SOP's) to cover these aspects of operations relieves the commander of the necessity for repeated planning and issuance of directives for the conduct of operations that follow an established pattern. This permits the commander to concentrate on other operations which must be planned and directed as requirements develop.

42. Factors Affecting Mission Performance

a. Tactical Operations. Modern tactics of warfare, both offensive and defensive, stress greater dispersion of facilities, more frequent and rapid movement of activities, greater emphasis on the proper selection and utilization of terrain to facilities both active and passive defense as well as efficient mission performance, and detailed planning and training in the conduct of defensive operations. On a fluid battlefield, pockets of enemy resistance may be bypassed by combat forces, making units in the rear areas vulnerable to enemy ground action

unless proper defensive measures are taken. Moreover, it is possible that elements of the service troops occupying these rear areas may have to wage limited offensive action to neutralize these threats to support activities. In addition, support organizations constitute the backbone of the overall rear area security and area damage control organization and, as such, will be required to plan and execute related operations and provide personnel and equipment therefor. Thus, general and depot support units must be able to wage an active defense, when necessary, and must be able to execute tactical movements.

b. Administrative Operations. As can be expected, the conditions noted above will complicate unit mess, supply, and administrative operations. Also, communications with parent units and resupply of class I, III, and V materiel may be interrupted. Therefore, the possibility of isolated operation for limited periods must be considered. The commander must make maximum use of his four basic resources—manpower, material, time, and facilities—to effectively accomplish his mission regardless of the circumstances. This requires continuous attention to the personnel management problem. Other functions which are allied to the administration of the unit and which must be given careful attention include preparation of SOP's, administrative records and reports, morale, and welfare of personnel, and operation of unit motor pools. One of the more important duties of the company commander is to inspect the administrative operations of his unit at frequent intervals. Inspections should include unit mess, unit supply, individual clothing and equipment, vehicles, and mission equipment.

Section II. ADMINISTRATIVE OPERATIONS

43. General

To facilitate command and operational control and to provide the administrative support essential to unit operations, each general or depot support company contains a headquarters platoon or section which provides command supervision and operational control for the company, and performs personnel administration, mess, unit supply, organizational maintenance, and communications functions. Cellular units, on the other hand, do not possess this capability and must be attached to an ordnance support unit capable of providing administrative, unit supply, mess, and organizational maintenance support.

44. Personnel Management

a. The objective of personnel management at any level is the efficient and effective utilization of individuals. The ordnance general or depot support unit commander is his own personnel manager, even though he has assistants to perform the detailed personnel actions.

b. Normally, ordnance companies are attached to a battalion headquarters, and personnel activities for the entire battalion are centered at battalion headquarters under the supervision of the personnel officer. The personnel records as well as the personnel specialists of the companies will be consolidated at battalion for this purpose. However, the responsibility for the training, assignment within companies, promotions, morale, and other matters affecting the men in the companies remains with the company commanders and should not be assumed by higher headquarters. For further information on personnel management and other aspects related to efficient unit management, see AR 1-65, AR 345-5, FM 9-1, FM 22-100, and DA Pam 20-300.

45. Mess Management

a. *Responsibility.* The feeding of troops is a command responsibility. A properly managed mess is one of the most effective means a commander has for building the health and morale of his unit.

b. *Operation.*

(1) *Company.* Ordnance companies usually

operate their own messes. Unless the commander sees fit to appoint a subordinate officer as mess officer as an additional duty, the commander himself exercises direct supervision over the mess. In the field, rations are normally drawn by the company directly from a quartermaster class I distribution point. Records necessary to the proper management of a mess will be kept as directed by the higher headquarters. Additional information on the operation of unit messes, accounting procedures, and training and duties of mess personnel may be found in TM's 10-405, and 10-415.

- (2) *Battalion.* No personnel are authorized at battalion level for supervising or controlling the operation of subordinate company messes. The headquarters and headquarters detachment of each battalion is attached for rations to one of the companies. The detachment is authorized a cook to augment the food service personnel of the company to which it is attached.
- (3) *Group.* The TOE of an ordnance group headquarters authorizes a food service supervisor who inspects the messes within the group. His mission is flexible and subject entirely to the desires of the group commander. Personnel of the group are attached for rations to one of the companies.

46. Unit Supply

a. *General.* Supply management and the maintenance of allied records are important administrative functions which are inherent in unit administration. Supply economy must be instilled in all members of the command until it becomes a habit to maintain, recover, safeguard, salvage, and transport all government property with maximum economy.

b. *Supply Procedures.* AR 735-35 delineates the responsibilities of commanders and property-book officers with respect to property accountability for supplies authorized and issued to organizations. This regulation also gives de-

tailed procedures for the operation of unit supply.

c. Personnel. The unit supply section consists of a supply sergeant and supply clerks. This section can be augmented as the commander deems necessary, keeping in mind that such augmentation usually reduces the capability of some other section. The supply sergeant is responsible to the unit commander for the unit supply room, for the turn-in to and the receipt of supplies from supplying agencies, and for the issue of supplies to individuals or groups within the company.

47. Motor Pool Operation

a. Each commanding officer is responsible for the proper operation, utilization, and maintenance of vehicles under his jurisdiction. For economy of operation and ease of maintenance, the organic transportation of a unit should be pooled whenever practicable. The motor sergeant of a general or depot support company supervises the preparation of maintenance rosters, scheduling of organizational maintenance services, and the maintenance of records and reports as outlined in TM 9-2810. The motor sergeant also supervises the operation of the motor pool and assigned personnel. Normally, the company commander appoints one of his officers as the unit motor officer in addition to his primary duty.

b. The organic motor transportation of the battalion headquarters detachment and any other cellular units attached to a company for administrative, supply, mess, and maintenance support will normally be pooled with that of the company. The company performs the organizational maintenance services and controls the dispatching of vehicles.

48. Standing Operating Procedures (SOP's)

a. Definition. An SOP is a set of instructions giving the methods to be followed by a unit for

the performance of those operations which the commander desires to make routine.

b. Purposes. SOP's are intended to—

- (1) Simplify and standardize the preparation and transmission of orders.
- (2) Simplify and perfect the training of troops.
- (3) Promote mutual understanding and develop teamwork among all elements of the organization.
- (4) Facilitate and expedite both tactical and administrative operations.
- (5) Minimize confusion and eliminate errors.

c. Use.

- (1) SOP's for defense should include detailed instructions for—
 - (a) Perimeter defense of the area.
 - (b) Passive air defense.
 - (c) CBR defense.
 - (d) Specific defense tasks for each man in the unit.
 - (e) Alert warning system.
 - (f) Destruction of materiel and facilities.
 - (g) Area damage control.
- (2) SOP's for technical operations should include instructions for—
 - (a) Evacuating unserviceable materiel, to include packing and preserving.
 - (b) Requesting, receiving, storing, and issuing supplies.
 - (c) Inspecting materiel received from direct support units or collecting points.
 - (d) Establishing priorities for the repair or reconditioning of materiel.
 - (e) Routing of job orders.
 - (f) Performing salvage and reclamation operations.

d. Conformance to Policies and Procedures. The SOP of any subordinate headquarters must conform to the policies and procedures established by SOP's of higher headquarters.

Section III. ORGANIZATIONAL INSPECTIONS

49. Definition and Purposes

a. Organizational (command) inspections are those performed by commanders, or their representatives, to determine whether the mess, sup-

ply administrative, and maintenance procedures of the units under their control meet prescribed standards; to determine whether equipment is serviceable and whether it is being utilized

properly; to reveal areas in which additional training is necessary; to evaluate the efficiency of operations; to determine whether directives and established procedures are being complied with; and to determine the operational readiness of personnel and equipment. They are conducted by or for the commander, to see whether the units of their command are capable of performing their missions. In these inspections, emphasis should be placed on examination of the areas of major deficiency noted in previous inspections.

b. Such an inspection of a general or depot support unit, when conducted by the unit commander, is termed an organizational inspection. When conducted by higher commanders it is generally referred to as a command inspection.

c. This general category of inspections also includes those inspections of a unit conducted by food service personnel of higher headquarters or by the inspector general of the command, or inspections of some aspect of training by representatives of major commanders or chiefs of technical services (e. g., inspections by Chemical Corps personnel or post CBR officers to determine the proficiency of the unit in CBR detection and defense).

50. Frequency

Inspections may be formal, where prior notice is given to the unit to be inspected and a set procedure is established, or informal, where no advance notice is given and no set procedures are established beforehand. The latter method permits a commander to see his equipment in operation and to determine the proficiency of personnel while they are engaged in the performance of assigned duties. Formal inspections of a company by its commander should be conducted at least weekly. Ordnance battalion and group commanders should make formal inspections at least once a month. Informal inspections are made at the commander's discretion. The frequency of these inspections will be determined by the commander concerned, who should take into consideration any other inspections to which his unit or units have been subjected recently.

51. Types

a. *Inspection of a Unit by Its Commander.*

These inspections normally cover all aspects of the unit's operations, including unit mess and administration. Particular emphasis, however, is placed on—

- (1) The condition of the unit's TOE equipment and the organizational maintenance performed thereon.
- (2) The operation of the technical supply function, including the efficiency of personnel, maintenance of records, storage procedures, and cooperation with maintenance operations.
- (3) The efficiency of the production control operation, including the proper use of the tools of control and the completeness and accuracy of records.
- (4) The efficiency and methods of operation of the shop supply section.
- (5) The thoroughness of the technical inspections and the ability of inspectors.
- (6) The functioning of the repair shops, to include conformance to correct maintenance procedures, completeness and accuracy of records, adherence to safety regulations, compliance with the principles of supply economy, and the proper utilization of the skills of the workmen. In the inspection of his unit, the commander may prepare a checklist according to his requirements, to include all the items or procedures he wishes to inspect.

b. *Inspection of a General or Depot Support Unit by Higher Ordnance Commanders.* Each general and depot support unit is subject to periodic inspections by ordnance battalion or group commanders. These inspections may be formal or informal, scheduled or unscheduled, and are conducted in much the same manner and for the same purposes as the organizational inspection conducted by the unit commander. The higher ordnance commander is interested in determining the efficiency and combat readiness of a combination of units. These inspections tend to be more formal than those discussed above, and because of the number of personnel required and the limitations on time, they may not be as extensive in coverage. Primary emphasis is usually placed on those aspects which most seriously affect accomplishment of the ord-

nance mission, and the areas in which deficiencies were noted in previous inspections or in which difficulties are known to exist or are suspected. They may be conducted while the unit is conducting operations; formations may be held with equipment being displayed and per-

sonnel standing beside the equipment for which they are responsible; or the inspection may be held while the unit is on the move, to see how rapidly and efficiently it can close out an old area, displace, set up a new area, and resume normal operations.

Section IV. MOVEMENT

52. General

The moves of a general support unit are influenced by a variety of factors such as weather, terrain, and the tactical situation. Depot units normally move only for defensive purposes. General and depot support installations remain in operation in the same locality as long as practicable without sacrificing service to support units. The limited mobility of general support units will also affect any motor moves undertaken. Using organic transportation, the move will have to be made in two or more trips, unless sufficient transportation is available from other sources. To concentrate the necessary personnel and equipment at the proper place in the prescribed time, commanders will have to decide whether to shuttle, to pool vehicles such as prime movers, or to request additional vehicles from the Transportation Corps. The time available to the commander will be the deciding factor.

53. Area Assignment

General support units are assigned support responsibilities by geographical area. Commanders assign areas of responsibility to ordnance groups based on recommendations of ordnance staff officers. Group commanders assign areas to battalions, and battalion commanders, in turn, assign areas to the companies within the battalions. The size of each support area is determined by the quantities of equipment to be supported. When supported units move across area lines, support is assumed by the ordnance unit responsible for support of the new area. Areas remain stable as long as the quantities of equipment in the areas do not change significantly and the ordnance units remain in the same locations. Each company should be located as centrally as possible within its area.

54. Task Assignments

a. When the general support commander re-

ceives a new task assignment which involves moving the unit, there are definite steps which he must take in order to insure service to his supported units. His first step will be to issue a warning order to the personnel of his company. As an example, such an order for a maintenance unit:

- (1) Informs unit personnel of the nature of the impending move.
- (2) Gives the work sections an opportunity to dispose of jobs in the shops by completing the repairs, evacuating the equipment, or preparing it for movement to the new area.
- (3) Gives the company an opportunity to start packing organizational and personal equipment for the move.
- (4) Permits implementation of the loading plan and the securing of additional transport if necessary.
- (5) Allows the current task assignment to be phased out. To do this, the unit will immediately discontinue acceptance of new work and initiate necessary coordinating action with supported ordnance units and other interested agencies.

b. If sufficient time is available between receipt of the task assignment and the time of the move, the commander should make a liaison visit to the direct support units which he is to support in the new area. During this visit he should determine—

- (1) The amount and kind of equipment to be supported.
- (2) The condition of equipment in the hands of supported troops.
- (3) Special maintenance problems which have not been satisfactorily resolved.

c. Based on this information, the commander can now establish a plan which will best furnish

the necessary support (to include the dispatch of technical assistance teams if and where necessary). In addition, he will plan for his reconnaissance and advance parties.

55. Reconnaissance

In cases where a long time will elapse between the receipt of the task assignment and the company move, the commander will normally have his officers, key noncommissioned officers, and whatever personnel he feels necessary accompany him on his reconnaissance. If time is critical, the reconnaissance and advance parties will go together. During his reconnaissance, the commander should accomplish the following—

- a. Select an area capable of defense yet suitable for technical operations.
- b. Select an alternate area.
- c. Plan a preliminary layout of the unit by sections.
- d. Reconnoiter the surrounding terrain and road nets.
- e. Coordinate with adjacent units.
- f. Prepare an overlay and map of the new area for use by the unit and advance party and for submission to higher headquarters.

56. Factors Governing the Selection of an Area

a. *Distance From Supported Units.* Proximity to supported units is not as important to general support units as it is to direct support units. However, when the general support maintenance, supply, and evacuation units are close to the direct support units, the demands on transportation facilities and the time required to move serviceable and unserviceable supplies will be lessened. In a fast-moving situation, general support units should move as far forward as feasible to reduce the number of moves required. This factor is of small importance to depot units, since accessibility to road nets, facilities, and parts usually determines their location.

b. *Roads.* Both general and depot support units should be located so as to permit easy access from as many directions as possible.

c. *Railways.* Wherever possible, the use of railways should be exploited since they are particularly useful for the receipt and evacuation of bulky supplies.

d. *Airfields.* Consideration should be given to the accessibility of air fields, particularly in the handling of low-density items.

e. *Waterways.* In some countries canals and rivers are often the principal avenues of transportation and should be fully exploited.

f. *Hardstand.* Because of the quantities of bulky items handled and the extensive maintenance performed, general and depot support units must have hardstand to operate efficiently. Particular care should be exercised to insure that there is adequate drainage, particularly in areas subject to seasonal rains.

g. Use of Towns.

(1) Advantages.

- (a) Hardstand and shop buildings are usually available.
- (b) Native labor is more abundant and the special skills required are more likely to be available.
- (c) Troops can be better billeted.
- (d) Supplies are usually concentrated in towns and cities.
- (e) Local power and water are usually more readily available.

(2) Disadvantages.

- (a) There is more traffic in and around towns.
- (b) Enemy sympathizers may interfere with the operations.
- (c) Towns present profitable nuclear targets.
- (d) Sanitation may be a problem.

h. *Defensibility.* How the area lends itself to defense from a nuclear or nonnuclear attack must be considered. In this regard, the enemy's capabilities will be considered and defense planning will anticipate any type of attack of which the enemy is capable. The possibility of attack by guerillas must also be considered. Intelligence agencies can provide much valuable information in both respects. In some cases, however, some of the elements of defensibility may have to be sacrificed to facilitate mission accomplishment and control of operations.

57. Area Layout

a. *General.* The objective of a good layout is to facilitate operations. In a supply operation, the objective is to make all supplies readily

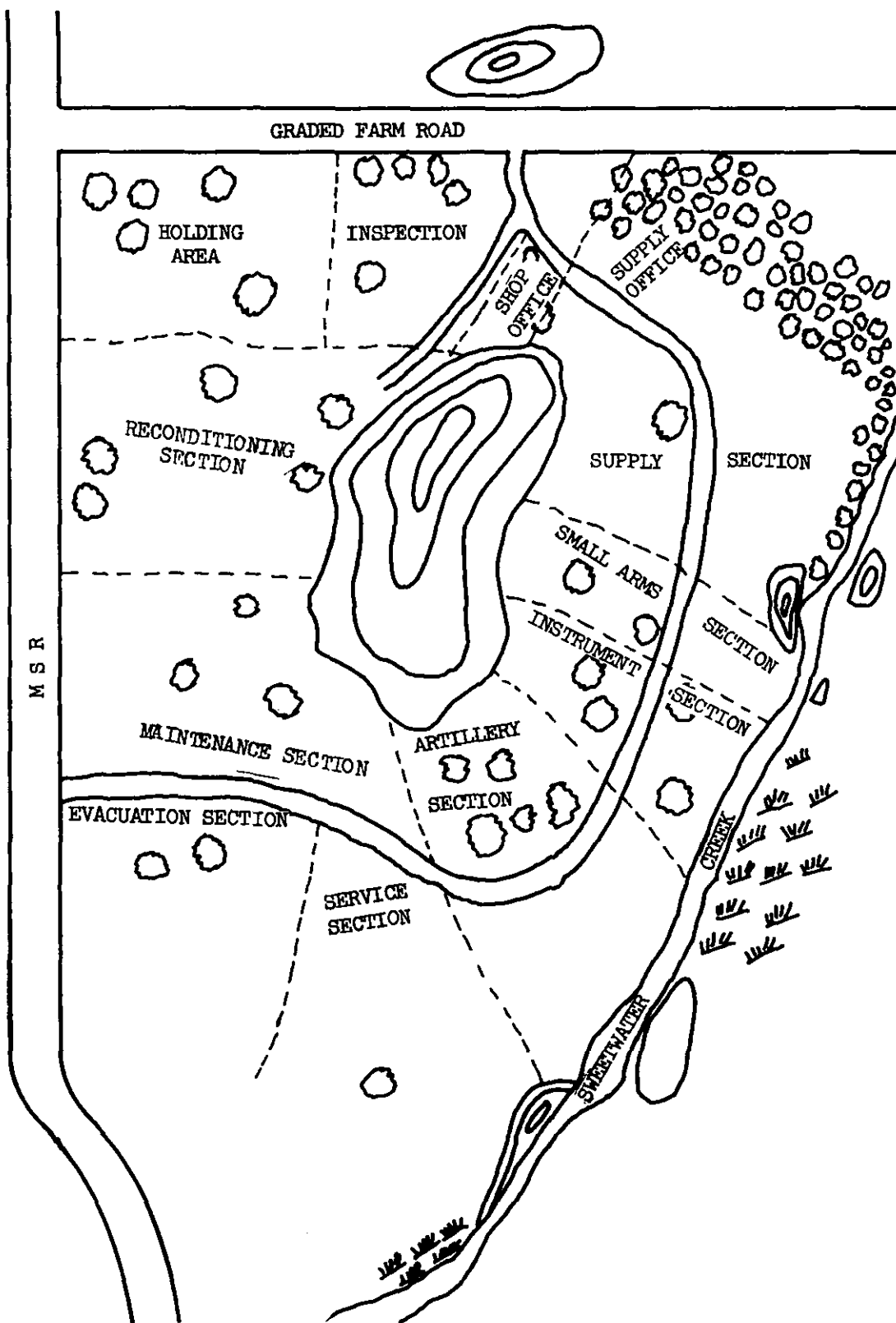


Figure 8. Typical layout of a general support company's area.

available and to reduce handling to a minimum. In a maintenance operation it is to facilitate the flow of work through the shop and to minimize the movement of repair parts, tools, and equipment. Some compromise usually must be made because of the necessity for defending the area. Since field situations seldom permit a unit to operate under ideal conditions, the type layout and the area requirements for each unit will vary according to the terrain, tactical situation, proximity to forward areas, and the type and amount of equipment to be supported. The detailed layout of the unit area is prepared on an overlay by the commander, who is assisted by advisors from each element of the unit. Figure 8 shows how a general support company's layout may be designed to facilitate technical operations and the defense of the unit.

b. Principles. Certain principles to be observed which remain unchanged despite varying situations are as follows:

- (1) Work sections will be located so as to provide ready access to the external road net as well as to each other.
- (2) Supply sections should be located to provide a direct line from the supply office to the storage areas.
- (3) Storage areas should be located sufficiently close to the road to permit easy access for supply trucks.
- (4) When possible, storage areas should also be located close enough to the maintenance areas so that supplies will be readily available to the maintenance shops.
- (5) Service sections should be located to provide easy access to all maintenance shops and to supply sections.
- (6) Dispersion areas for vehicles awaiting shop and vehicles ready for disposition should be separate to avoid confusion and mistakes.
- (7) Vehicle dispersion areas should be adjacent to the maintenance areas but in such a position that control and security are possible from the shop and supply offices.
- (8) Sufficient security posts will be established to protect the entire area from surprise air or ground attacks as well

as to prevent sabotage and pilferage. When possible, these posts will be located within sight and sound of each other and in such a position as to be able to support each other with fire.

- (9) Security posts will never be located so that the fire from any post will endanger friendly personnel occupying the area.
- (10) Telephone communications will be established between manned security posts and unit command posts, particularly during hours of darkness.
- (11) Areas will be chosen so as to make use of terrain features such as rivers and swamps for natural defense of flanks.
- (12) High ground rather than low ground should be occupied.

c. Troop Bivouacs. Troop bivouacs may be located in one spot or separated into sections. Greater control is possible when troops are bivouacked in one spot. This also insures greater safety to personnel from moving vehicles. However, if the unit is subject to guerilla attacks, it can be defended better if troops are bivouacked in their respective work areas. Adequate communications must be maintained between bivouac areas.

58. Advance Party

The advance party will normally consist of one officer and sufficient noncommissioned officers and enlisted personnel representing all the company sections to direct and accomplish the work of readying the new area for occupation by the unit. Among the tasks which the advance party must perform are—

- a.* Clearing bridges on route of march.
- b.* Placing signs along MSR and posting guides along the route where necessary.
- c.* Inspecting new area for mines.
- d.* Preparing hasty fortifications to cover avenues of approach.
- e.* Staking out company sections based on the layout planned by the commander on his reconnaissance.
- f.* Preparing positions for crew-served weapons.
- g.* Laying communications wire to defense positions and shop area.

- h. Digging sumps for the latrine and kitchen.
- i. Clearing brush as necessary from new area.

59. Convoy Movements

After the unit layout is made and each element is informed of the site it will occupy in the new area, detailed planning of the movement can begin. All moves must be coordinated with the moves of other units. Such coordination and the obtaining of road clearances will be accomplished through the provost marshal or other appropriate transportation control agency. General and depot support units will normally move by motor transport. This transport may include not only organic vehicles, but also any additional transport detailed to assist in the move. In most respects, ordnance units face the same problems in convoy movements as any other units. Some of these problems include control of the movement, defense of the convoy if attacked en route, and feeding personnel and refueling vehicles if the move is a long one. The solutions to many of these problems can be found in FM 25-10. In other respects, ordnance units have certain different problems. The equipment in the field supply, general support, and general automotive support companies varies greatly in size and weight—from ¼-ton vehicles to tank transporters and tank recovery vehicles. This variation in size and weight requires a careful route reconnaissance to include an accurate determination of the capabilities and clearance of bridges, roads, and tunnels. Another problem is the nature of the loads of these units. The field supply company, for example, will haul bulk supplies. One final consideration is movement by night rather than by day to deny the enemy observation of the move. Drivers

participating in such movements must be thoroughly trained in blackout driving.

60. Rear Party

Because of the limited mobility of units performing general or depot support functions, it is impractical to haul bulky unserviceable equipment to new areas when the units displace, unless command decision or the tactical situation make such action necessary. In most cases, unfinished maintenance tasks will be completed by a rear party left behind to close out operations in the vacated area. If this party is unequal to the task, arrangements may be made for another maintenance unit in the area to accomplish repair. The rear party will also perform any other functions necessary to close out operations in the old area, such as covering sumps, etc. The composition of this party will depend on the work required to complete and close out operations in the old area. The rear party will maintain communications with higher headquarters and will remain in the old area until forced out by enemy action (guerilla action, fallout, etc.) or until the unit command post in the new area becomes operative and technical operations are resumed.

61. Priority of Tasks in the New Area

Immediately upon closing into the new area, the commander informs his higher headquarters of the fact and confirms the location. Then, the following tasks are performed in the order indicated—

- a. Complete the perimeter defense system.
- b. Make preparations for technical operations.
- c. Complete housekeeping facilities for unit personnel.

Section V. SECURITY AND DEFENSE

62. General

a. The responsibility for the security and defense of a unit rests with its commander. At all echelons, commanders are charged with the responsibility for the maximum employment of all measures at their disposal in the conduct of both an active and passive defense.

b. Under present concepts of warfare, the requirement for dispersion is no longer limited

to combat forces. The threat of attack by mass destructive weapons delivered over great distances with great accuracy makes increased dispersion mandatory. This is true of both combat and service forces and necessitates the dispersion of troop concentration of all types, as well as installations and activities. Technical service installations in rear areas are lucrative targets for nuclear attack and must be well camouflaged

and well dispersed. Dispersion, however, complicates the problem of control, makes mutual defense more difficult, and affords opportune targets for guerilla or airborne attacks. The solution to the problem lies in the establishment of an effective outpost and warning system; establishment and maintenance of an effective communications system; and the utilization of exterior and interior guards systems. This defensive system is supplemented by defensive works and a mobile reserve force which is centrally located so as to be able to converge rapidly on any area of the unit where an enemy breakthrough is likely. In the conduct of a defense, general and depot support units are virtually on their own, and defense plans must be made with this in mind. Defense against airborne attack, guerilla action, and infiltration is conducted in accordance with the principles outlined in FM 31-15.

63. Security and Defense Measures

a. General.

- (1) Defense plans must provide for the maximum use of all personnel of the command. The general defense plan should provide means of control and communication. When possible, alternate command and communication means should be established. This is particularly true for outlying installations. A warning system should be established for the rapid dissemination of information to all sections concerning an impending or actual enemy attack. Defense plans must include both active and passive measures.
- (2) In the case of higher headquarters, particularly battalions, SOP's will be distributed to standardize normal procedures for defense and security and to insure that there are minimum losses in personnel, time, and equipment consistent with the mission. Individual units will prepare SOP's as needed, insuring their conformance with those of the higher headquarters. All personnel, including those engaged in shop work, must be thoroughly familiar with these SOP's.

- (3) The shop area must provide for defense against enemy raids and for protection against guerillas. Initially, the area must be selected with consideration for tactical defense as well as the accomplishment of the technical mission. Trenches or foxholes should be dug close to the working areas to accommodate all personnel. An adequate defense plan must be established for each area. Each section should be responsible for defense of its own area and should be placed so as to assist adjacent sections by supporting fire. Plans should also include the use of any combat vehicles undergoing repairs in the shops. These should be so placed that their armament can be used in emergencies.
- (4) One of the principal weapons an attacking force may use against an ordnance installation is fire. Consequently, all defense plans should provide for an armed firefighting crew to limit the effects of any such fire. Within the area, the unit commander will establish such security measures as perimeter and internal guards to frequently check all areas, shops, and warehouses, and will also fully utilize all features of terrain and construction to augment his security and defense measures.
- (5) Individual unit defense plans may have to be modified so that defense of the entire rear area may be facilitated. Although defense of a unit is primarily the unit commander's responsibility, the individual unit defense plans constitute a part of the overall command-wide rear area defense plan, and coordination with the agency responsible for rear area security and area damage control is essential to insure economy of personnel and unity of command. (See section VI and FM's 31-15, 100-10, and 101-5.)

b. CBR Defense.

- (1) *Responsibilities.* Plans for defense against chemical, biological, and radiological (CBR) attacks are a necessary

and important part of any overall defense plan. To insure adequate CBR discipline and training, the unit commander must have certain of his officers and noncommissioned officers trained in CBR detection and protective techniques. These personnel assist the commander in assuring that each individual in the unit is thoroughly familiar with basic CBR defense measures. The commander must provide prescribed standards against which the individual's knowledge can be periodically tested and refreshed. These standards will—

- (a) List the individual's responsibilities for his personal protection against CBR attacks.
 - (b) Stress the measures necessary for the care and maintenance of individual equipment.
 - (c) Indicate the individual's part in unit CBR defense measures.
- (2) *CBR Defense Plan.* Since CBR agents can be delivered by aircraft, artillery, missiles, and ground troops, unit personnel must be trained to recognize these attacks and be familiar with the measures necessary to minimize the effect of the damage. The CBR plan will include—
- (a) A warning system to designate the type of attack, if possible.
 - (b) Provision for and duties of unit CBR personnel, fire guards, and security guards.
 - (c) Provision for training personnel (FM's 21-40, 21-41, and 21-48).
 - (d) Provision for inspecting equipment received from other units for contamination.

- (e) Designation of a separate area for contaminated equipment and methods for its segregation.
- (f) Provision for maintaining liaison with the Chemical Corps for advice and assistance.

64. Camouflage

a. Necessity for Camouflage. The continued survival of ordnance general support facilities in the field will depend greatly on the quality of their camouflage. A greater need for camouflage will exist in barren and flat country than in wooded and hilly country. The unit commander must insure that all personnel under his control are familiar with the practical application of the provisions of FM 5-20. Every unit should secure and use camouflage nets. When properly erected, these nets are of great assistance in providing cover for the various elements of the unit.

b. Camouflage Discipline. All personnel must be thoroughly instructed in the need for camouflage discipline. Unit commanders, subordinate commanders, and section chiefs must exercise every means at their disposal to maintain effective camouflage discipline, both within and adjacent to the maintenance shops and supply areas. Proper camouflage discipline will serve to prevent discovery from ground as well as aerial observation. Personnel must not be permitted to park equipment in exposed positions near field maintenance shops. Reflecting surfaces such as headlight lenses and windshields must be covered. Care must be taken to avoid making new trails or tracks into the area, for these are readily observed from the air. Modern night photography techniques make it mandatory that camouflage discipline be strictly enforced during the hours of darkness as a safeguard against revealing positions on aerial photos.

Section VI. REAR AREA SECURITY AND DAMAGE CONTROL

65. General

a. Efficient mission performance by ordnance unit requires that adequate safeguards be provided to protect personnel, equipment, and facilities from attack from any source—aircraft, missiles, enemy ground action, guerillas, or sabo-

tage. Moreover, if an attack does occur, the defensive system should be such as to minimize the effects of damage and the interruption of operations. Each ordnance unit, therefore, is responsible for defense and security of its own area, for cooperation with other units in de-

fending a specific area containing a number of units, and for providing personnel for the composition of organized area security forces, if necessary.

b. In addition, the ordnance unit, by virtue of the types of equipment it employs and the skills of its personnel, plays a vital role in area damage control operations. It provides personnel and equipment to assist in limiting the damage caused by mass destruction weapons, and to expedite repair of equipment or facilities and the removal of obstructions from roads and other areas of operations so that activity in these areas can return to normalcy with a minimum of interruption.

66. Organization and Responsibilities

a. *General.* The defense of rear areas and provisions to minimize the immediate effects of a mass destruction attack or natural disaster are allied functions which must be considered concurrently to assure that damage due to enemy attack or natural disaster is limited, and to preclude further damage to installations, equipment, and personnel due to secondary effects of the attack (contamination, fires, and unsafe conditions of structures) or enemy followup action such as guerilla or airborne attack. Rear area security and damage control are accomplished in two phases, and include those measures taken prior to an attack or disaster and those measures taken during and following such an attack or disaster.

(1) The measures taken prior to an attack are—

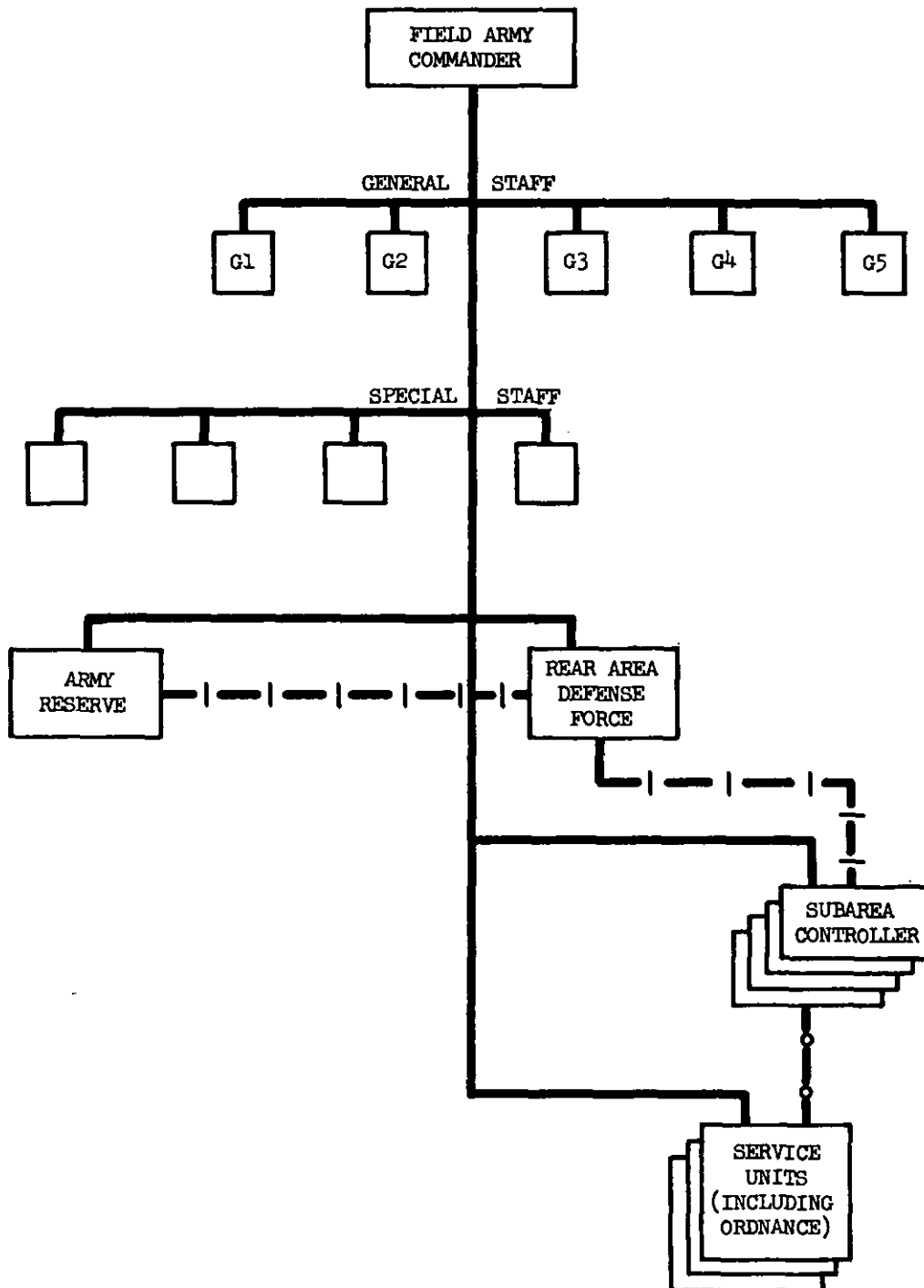
- (a) Adequate prior planning.
- (b) Organizing, equipping, and training area damage control personnel.
- (c) Organizing, training, and equipping a rear area security force.
- (d) Dispersion and concealment.
- (e) Use of natural cover or any protection afforded by terrain features in selecting sites.
- (f) Establishment of an efficient warning system.

(2) The measures taken during and immediately following an enemy mass destruction attack or natural disaster include—

- (a) Control of personnel and traffic (military and civilian).
- (b) Active defense against guerilla or airborne attack.
- (c) Fire prevention and firefighting.
- (d) First aid and evacuation of casualties.
- (e) Protection against chemical, biological, and radiological hazards, including movement to abandon heavily contaminated areas.
- (f) Disposal of unexploded ammunition items.
- (g) Initiation of salvage operations and the clearance of debris and other obstructions from roads and installations so that normal operations may be resumed.
- (h) Distribution of emergency supply of food, clothing, and water.

b. *Organization.*

- (1) Rear area security and damage control in a theater of operations which contains large numbers of installations and activities, and covers a large geographical area, cannot be adequately administered by a single controller. In such cases, the area must be divided into subareas, with subarea controllers appointed for each.
- (2) Each subarea will have the capability to minimize damage within its boundaries, this capability being provided by units and installations located within the area. Each ordnance company or larger unit is required to furnish a team, or teams, depending on requirements and the capabilities of the unit. These teams include light and heavy rescue teams, labor teams, and radiological monitoring or survey teams.
- (3) A key individual in the organizational chain for area damage control operations is the incident officer. He coordinates the efforts of damage control personnel at the scene of the damage. Operational control over incident officers is exercised by appropriate subarea controllers.



Legend:

Command —————

Coordination — | — | — | —

Operational control
when plans are in effect — o — o —

Figure 9. Organization for rear area security and damage control in a field army service area.

- (4) For additional information on the organization for rear area security and damage control, see FM's 31-15 and 100-10. FM 101-5 contains examples of forms to be used in administering rear area security and damage control plans. Figure 9 depicts a type organization for rear area security and damage control in a field army service area.

c. Role of Ordnance Units.

- (1) Each ordnance unit commander will survey his operations and make plans to lessen the possibility and effects of an attack, using all passive means of defense at his disposal. He also plans the action to be taken during the attack and what measures are necessary to resume mission operations after the attack. These plans are coordinated with the plans of other units by the subarea and rear area security controllers, in turn, and may be modi-

fied or augmented so that the composite of individual plans will fit the requirements of the area.

- (2) Ordnance units will usually furnish the following types of teams to assist in area damage control operations.

- (a) *All companies.* These units will each organize and equip one light rescue squad whose functions include rescue and removal of casualties, first aid, and decontamination.

- (b) *Ordnance general support, general automotive support, and recovery and classification companies.* These companies will each organize and equip two heavy rescue squads (equipped with jacks, cross-cut saws, wreckers or cranes, trucks, oxyacetylene welding and cutting outfits, etc.) whose functions include rescue and removal of casualties, debris clearance, and decontamination.

CHAPTER 8

COMMUNICATIONS

67. Importance of Good Communications

Effective command and control of general and depot support units depend, in large measure, on the proper installation, operation, and maintenance of communications channels. Communications facilities are essential to coordinate the operations of the various elements of the unit; to expedite the transmission of information, orders, and requests among the various elements of the unit; and to facilitate control and direction of the unit by higher headquarters.

68. Methods of Communication

a. General.

- (1) Wire is the principal means of communication utilized by a general or depot support unit, especially when it is functioning in a depot support role. Most companies and some detachments, however, are equipped with radio sets. Most of these radio sets are mounted in vehicles and are used to provide communications between the unit headquarters and elements of the unit operating away from the headquarters, and between the general support unit and higher headquarters. For information as to the specific types and quantities of signal equipment authorized each unit, see the appropriate TOE.
- (2) When the use of radio or telephone facilities is impractical or impossible due to security reasons, damage to signal equipment, jamming, or for any other reason, it may be necessary to utilize messengers. Personnel of the company not directly engaged in technical mission operations should be utilized as messengers.

b. Companies. The bulk of the communications originating in a general or depot support

unit will be transmitted by written message or telephone. Most companies are authorized a switchboard, and each of the platoons of the company is tied in to the switchboard, at company headquarters. Elements of the company which are equipped with radios and are operating away from the company area will maintain contact with company headquarters by radio (e.g., the recovery sections of the recovery and classification company). The headquarters switchboard will be connected to the nearest switching point of the area communications system to facilitate communications with higher headquarters. The headquarters radio is part of the ordnance battalion radio net. Radios should be used only for essential communications, and messages should be as brief as possible.

c. Detachments. Most detachments are provided telephones. Generally, switchboards are not provided; therefore, the detachment must have a line from the switchboard of the unit to which it is attached. Explosive disposal detachments are equipped with portable radio sets to facilitate voice communications between detachment headquarters and the various elements of the detachment.

69. Installation and Operation of Facilities

The installation and operation of communications facilities will be in conformance with the signal operating instructions (SOI) and standing signal instructions (SSI) of higher headquarters. These instructions may be supplemented by unit communications SOP's.

70. Duties and Responsibilities of Personnel

a. General. The communications personnel of a general support unit include radio operators, switchboard operators, and wiremen. Some are communications specialists provided by TOE; others perform communications duties in addition to their primary duties. For example, radio

operators are not always provided by TOE. When necessary, truck drivers, may be assigned this function as an additional duty. The operations and training of communications personnel are supervised by the unit communications officer, who performs this function as an additional duty.

b. Communications Officer. The unit communications officer performs the following functions:

- (1) Keeps the commander informed on the communications situation.
- (2) Coordinates communications with higher, adjacent, and attached unit.
- (3) Prepares communications plans and communications SOP's for the commander's approval.
- (4) Assists in the selection of the site for the unit command post.
- (5) Supervises the installation, operation, and maintenance of the unit's communications system.
- (6) Determines communications equipment and supply requirements.
- (7) Prepares extracts of current SOI's and SSI's for use by communications personnel.
- (8) Supervises the training of communications personnel.

c. Wireman. The wireman installs and maintains the field-wire communications system and performs organizational maintenance on the field-wire communications equipment of the unit. He will also operate the switchboard if the TOE does not provide for a switchboard operator.

d. Radio Operator. The radio operator is responsible for the proper use of the radio, for using correct radio procedure, and for operating any cryptographic devices issued to the unit. He must be familiar with the SOI and SSI with respect to radio procedures, call signs, security, etc. He is also responsible for performing organizational maintenance on the radio equipment, for knowing its capabilities and limitations, and for knowing which other facilities are incorporated into the radio net of which the company is a part. If the TOE of the unit does not provide for radio operators, the unit commander should select operators and alternates and arrange for their training either

at a school established for the training of operators or at a Signal Corps unit.

e. Switchboard Operator. The switchboard operator installs, operates, and maintains the unit switchboard. He must know the techniques of installation and operation of field telephone equipment, the capabilities and limitations of this equipment, and the facilities incorporated into the communication system to which his switchboard is connected. In units not assigned a switchboard operator by TOE, this duty is performed by the wireman.

71. Operations, Maintenance, and Training

a. One of the first things a unit must do after arriving in a new area is to establish its internal communications and notify higher headquarters that it is ready to have external communications established. Once established, the communications system must be employed in accordance with established communications procedures. Users of communications equipment must be impressed with the necessity for maintaining security, and must be instructed to keep the number of messages to a minimum and to make the messages as brief as possible.

b. In the performance of organizational maintenance, personnel of the unit will follow the procedures contained in Signal Corps technical manuals covering the items of communications equipment issued to the unit. Field maintenance on this equipment and technical assistance will be provided by supporting signal units.

c. The training of communications personnel should be based on the provisions of FM's 24-18 and 24-20. These publications discuss the employment, operation, capabilities, and limitations of radio and wire communications.

72. Signal Corps Communications Responsibilities and Policies

a. General.

- (1) The signal officer of each command echelon is responsible for the installation and operation of an area communication system designed to meet the requirements of command flexibility, mobility, and dispersion. In addition, he is responsible for providing communications for all of the echelons of the headquarters of the command with

which he serves. Access points to the intersectional communication system are provided by theater army logistical command.

- (2) Subordinate commands are responsible for providing internal communications for their units within their organic capability. Commanders of all units and activities will submit their requirements for communications service to the nearest area signal center. The locations of these signal centers are normally found in paragraph 2c (SERVICE) of the applicable command administrative order. Commanders are also responsible for informing area signal centers of pending displacements or other changes which would increase, reduce, or terminate the requirement for communications service.

b. Policies.

- (1) The signal officer of each major command has the responsibility for determining the type and extent of common user communications to be provided to using units. This determination will normally be exercised by the commander of each area signal center based on its capability and the policy guidance provided by the major command.
- (2) Communication services provided by the area system to service support units take priority after that provided for combat units and combat support units.
- (3) Area signal centers will be discontinued when the number and type of units supported makes the continued use thereof uneconomical. Commanders of area signal centers being discontinued will coordinate technical arrangements with local commanders to provide communications service for units and activities remaining in the area.
- (4) Access to the intersectional communications system for nonmilitary activities and agencies of allied governments will be in accordance with theater policy.

- (5) Point-to-point circuits will be established as required to support the military operation. The bases of these circuits will depend upon the traffic precedence and volume, and the tactical necessity.
- (6) Subordinate non-Signal Corps units are forbidden to use indigenous communications facilities unless approved by the major command concerned.
- (7) Radio relay and microwave systems constitute the primary means of signal communications in the theater, and therefore will have priority of site selection subordinate only to the requirements of combat units.
- (8) Units will not use sky-wave antenna equipment unless approved by the major command concerned.
- (9) Frequency interference which cannot be cleared within the jurisdiction of subordinate commands will be reported to the signal office of the major command concerned.

c. Security and Intelligence.

- (1) All units will take necessary steps to protect captured enemy communications and electronics installations from unnecessary damage and will report the locations of these installations by the most expeditious means to the signal office of the major command concerned.
- (2) Classified information will not be transmitted in the clear by electrical means except as approved by commanders in those instances in which the nature of the information is such that enemy interception will have no effect on current or projected operations.
- (3) Actual or suspected loss or compromise of SOI's, codes, ciphers, or cryptographic equipment will be reported to the signal officer of the major command concerned by the most expeditious means.
- (4) Suspected or confirmed enemy attempts to employ communications intelligence

techniques against friendly communications systems will be reported immediately to the nearest available command signal officer. Typical incidents which will be reported are—

(a) Large volume of nonauthenticated or suspected spurious messages being received.

- (b) Enemy jamming of radio circuits.
- (c) Discovered or suspected “taps” on wire systems.
- (d) Missing friendly messengers.
- (e) Loss, suspected loss, or compromise of communications documents, including classified clear-text messages.

CHAPTER 9

TRAINING

73. Training Objective and Responsibility

a. The training objective of ordnance service is to train individuals to become proficient in the performance of their assigned tasks and to further cross-train them in other related skills.

b. The training of personnel of an ordnance unit is a command responsibility, and it must be conducted in such a manner that the efficiency and performance of the unit's mission will not be materially interrupted.

74. Methods of Training

a. The Army provides an extensive system of service schools to teach officer and enlisted personnel the special skills and knowledge required to effectively perform their duties. It is desirable to have all personnel school trained and to take full advantage of the quotas authorized by these schools. Prospective students must be carefully screened to insure that they will be able to successfully complete the course of instruction. On-the-job training should be substituted for formal courses for repairmen helpers, when possible.

b. Unit training is conducted utilizing assigned personnel as instructors. This training supplements the service school system. It provides special instruction and on-the-job training to those persons who have not previously received training at service schools. The personnel to attend, subjects to be taught, instructors, facilities, and standards to be obtained are specified by the unit commander based on directives from higher headquarters. Items of equipment scheduled for maintenance should be used for instructional purposes whenever practicable. Unit training may be necessitated by the contemplated receipt of new equipment; changes in procedures, doctrine, mission, or method of operations; or special modifications to equipment.

c. On-the-job training is that portion of unit

training received during the actual performance of duty. It is potentially the most effective method available for the training of ordnance technical skills. Work itself is not training unless it is competently supervised in order that the proper method for correcting deficiencies and the application of approved methods and techniques can be effectively learned. The most effective method of on-the-job training is grouping experienced specialists with untrained personnel.

d. Periodic training conferences should be held during which new techniques or information are discussed and new requirements outlined. Participants should be afforded an opportunity to present their problems and propose solutions. Conferences are effective only when participants acquire knowledge and reach a mutual agreement on the problems considered. To be effective, these conferences must be held with both supervisory personnel and selected specialists in attendance.

75. Instructor Training

Proper training requires the selection of competent officer and enlisted instructor personnel. However, it must be remembered that a good specialist is not necessarily a good instructor. The principles outlined in FM 21-5 and FM 21-6 for selection and training of instructors should be followed. Personnel selected as instructors should be given special instruction in the following:

a. Specialist training (this training should be the same course of instruction that students are to receive).

b. Instructor training and controlled observation (on-the-spot correction).

c. Preparing, conducting, and scoring tests.

76. Officer Training

Additional schooling must be scheduled for

officers to insure that they are familiar with their supervisory and managerial duties. Practical exercises are even more important for the officer as he seldom has the opportunity to operate, service, and maintain pieces of equipment for which he has supervisory responsibility.

77. Training Programs

a. Army training programs (ATP's) are documents published by the Department of the Army which provide guidance in the preparation of training programs and training schedules for specific types of troop units of the active Army and Reserve components. ATP's 9-201 and 9-302 are applicable to ordnance units. ATP 20-5 contains information on field exercises and maneuver training. ATP's are indexed in DA Pamphlet 310-3.

b. Army Subject Schedules (ASubjScd) are used as guides in preparing lesson plans and practical exercises. They provide the subject matter to be presented and the references and training aids to be used in preparing and conducting the instruction. There are generally two basic types of subject schedules—MOS and non-MOS. The MOS subject schedule provides the instruction required for the potential qualification in an MOS. The non-MOS subject schedule provides training in subjects prescribed in ATP's for the training of individuals and units.

Army subject schedules are listed in DA Pam 310-3.

c. Army training tests (ATT) are used to evaluate the ability of units, both tactically and technically. Test scores are indicative of the ability of a unit to accomplish its assigned mission and show whether the individuals of the unit are MOS-qualified. The index for ATT's can be found in DA Pamphlet 310-3.

78. Training Assistance

a. Specific methods and techniques of military instruction are described in FM 21-6. In general, a review of FM 21-6 will assist the instructor in—

- (1) Preparing lesson plans.
- (2) Using training aids properly.
- (3) Developing effective speech habits.
- (4) Administering tests.

b. In addition to the assistance provided by formal publications (technical manuals, DA Pamphlets, Army training programs, Army subject schedules, Army Regulations, and field manuals), the ordnance unit commander has a valuable source of information in the form of service school special texts, lesson plans, and subject schedules. These materials may be obtained by writing to the commandant of the respective service school. In addition, each service school offers a self-education program in the form of nonresident courses which can be invaluable to every member of the Ordnance Corps.

CHAPTER 10

SAFETY

79. General

Since injuries and accidents can seriously hamper a unit's operations, an effective safety program is essential to the successful accomplishment of all ordnance operations. This program must encompass all phases of operations. All personnel must be thoroughly indoctrinated in the proper handling of materiel, the safety procedures to be exercised when using tools and machinery, and the precautions necessary when handling or storing hazardous ordnance materials. In addition, personnel must be impressed with the importance of constant vigilance to detect potential hazards, and encouraged to take remedial action to reduce or eliminate the danger. They must also be required to report all accidents or safety hazards promptly.

80. Safety Organization

A safety program has but one objective—the prevention of accidents. Any program set up for this purpose should be designed to cover all operations, taking into consideration any conditions peculiar to these operations. The program should be based on the provisions outlined in AR 385-10. The implementation of the program necessitates the establishment of a safety organization consisting of a safety officer, who is responsible for the supervision and coordination of all safety activities within the unit, and a safety committee consisting of section supervisors or foremen. This committee should hold meetings at regular intervals for the purpose of discussing preventive measures and any other pertinent information which may result in the reduction of accidents, elimination of hazards, or the improvement of safety practices.

81. Principles

An effective safety program will depend on

the proper application of the following principles of accident prevention.

a. Creation and Maintenance of Active Interest. The emphasis on safety must be vigorous and continuous. The best safety program in existence will soon deteriorate unless all personnel are kept actively interested and are willing to participate in the program. The interest in safety should be maintained by appealing to the pride of all unit personnel, pointing out the responsibilities they have to themselves and to the unit. Any suggestions on the improvement of safety operations should be carefully considered, and the individual making the suggestion should be given credit if the idea is adopted or an explanation if the suggestion is impractical. Supervisors are particularly interested in the effect of accidents on efficiency and productivity. Furnishing supervisors with facts and figures to illustrate how accidents can affect the operation of their sections and, conversely, how increased demands on productivity can increase the frequency of accidents, is very effective in maintaining their interest in the safety program.

b. Fact Finding.

- (1) This principle refers to the assembling of essential information bearing upon accident occurrence and prevention. With regard to each accident, the following facts should be determined:
 - (a) Who was injured or what was damaged.
 - (b) The time and place the injury or accident occurred.
 - (c) The severity (and often the cost of the injury or accident).
 - (d) The nature of the accident or injury.
- (2) For accident prevention purposes, it is necessary to supplement the above information with facts concerning the

how and why of the accident; in particular, the specific unsafe act committed, if any, together with the reason for its commission and the nature of any specific mechanical or physical hazard, if one existed. If a tool or piece of equipment was a contributing factor, it should be determined whether the proper tool or piece of equipment was being used, whether it was being used properly, and whether it was defective.

c. Corrective Action Based on Facts. The prevention of accidents depends upon the creation and maintenance of active interest in safety, which must be governed by the facts of the particular problem in question. Any corrective action that is finally adopted should be based on available and pertinent facts. These facts are not determined solely as a result of accidents. Near-accidents, too, must be reported, together with all available information, so that existing hazards and unsafe procedures or conditions can be eliminated. Similarly, any procedure or condition which might constitute a threat of the safety of the organization should be reported so that remedial action can be instituted. In this regard it has been proven that some individuals are accident prone. If experience indicates that the same individual is repeatedly an accident victim, the individual should be placed in an assignment where he is least likely to endanger himself or others.

82. Safety Plan

A few of the elements that should be included in any safety plan are indicated below. This list is not all inclusive, but the more salient elements of a safety plan are:

a. Accident Reporting. A definite procedure should be established for reporting accidents. The procedure should emphasize promptness and completeness of reporting all accidents or injuries, no matter how slight.

b. Cause Determination. The commanding officer, or a person designated by him, should investigate all injuries or accidents to determine their causes and to take corrective action to prevent their recurrence.

c. Equipment Damage. Any accident resulting in damage to equipment should be reported

immediately. The continued operation of damaged equipment can result in injuries to personnel.

d. Fire Prevention. "No Smoking" signs should be posted wherever fire hazards exist. Smoking should be permitted only in designated safety areas. Gasoline, oil, and other flammables should be stored only in approved locations and in containers authorized for this purpose.

e. Vehicle Operation. All personnel should be trained and qualified, if possible, to operate any vehicle or item of materials handling equipment used by the unit so that they can operate the equipment safely in emergencies.

f. Firefighting Equipment. Firefighting equipment must be available where and when needed, and all personnel should be familiar with its location and operation. This equipment should be inspected frequently to determine its serviceability.

g. Special Clothing and Equipment. All personnel must be thoroughly familiar with the use, location, care, and inspection of any special clothing or equipment which they may be required to use. Moreover, when the nature of the job requires such clothing or equipment, its use should be rigidly enforced.

83. Responsibilities

a. Commander. It is the commander's responsibility to insure that all activities of his unit are conducted in accordance with established safety rules. He is also responsible for determining the causes of accidents and for seeing that corrective action is taken to prevent their recurrence. When no existing safety rule applies or where a deviation from an established safety rule is desired, it is the responsibility of the unit commander to request establishment of a new rule or permission to deviate from an existing rule. This request, including full particulars and detailed plans and specifications, is submitted to the appropriate headquarters.

b. Supervisor. Supervisors and foremen exercise direct daily supervision over operating personnel. In their daily contacts with personnel on the job, they are in a position to personally witness working conditions and the hazards to which operating personnel are exposed.

The supervisors and foremen are the persons through whom the full force and effect of all accident prevention measures find application in daily operations. They should call frequent and regular meetings to brief all personnel on safety procedures, to elicit any suggestions on the improvement of safety practices, and to publicize any newly adopted safety procedures. Such meetings should be held at the work locations, and their objectives should be to brief all personnel on safe job performance for new and unusual work or routine jobs, and to re-impress workers with the need for constant alertness and observation of safety measures. This must be done so that familiarity with certain operations will not result in unwarranted shortcuts or laxity in job performance which could result in increasing the accident rate. The agenda for such meetings should include the following items:

- (1) The overall job and the end result expected.
- (2) The why, how, and when of the job and any ideas from the group concerning improvement of methods and procedures.
- (3) The key points, steps, or actions that are required and the importance of proper handling of equipment at each step.
- (4) The part to be played by each man. The supervisor must make sure that each man understands his assignment.
- (5) The existing and anticipated hazards, and the steps that should be taken to cope with these problems.
- (6) The availability of special tools and equipment of the proper type to do a job, and how they should be used.
- (7) The need for prompt reporting of all injuries, accidents, or near accidents, and the importance of first aid when such action is required.
- (8) The need for constant vigilance to detect and correct unsafe practices and conditions so as to prevent accidents and injuries.
- (9) The establishment and implementation of definite routine safety inspection systems.

c. Individual Responsibility. All personnel should be made to realize that safety rules have been established for their protection and welfare. It is their responsibility to follow all instructions and to use all the safeguards incident to the use of tools, machinery, equipment, and processes. Cooperation between the workers and their supervisors, as well as co-operation among workers in the development and practice of safe working habits, is essential in order to prevent injuries to personnel and damage to materiel and facilities.

84. Special Precautions

a. There is a "right way" and a "wrong way" to use a tool or piece of equipment. Unless personnel are familiar with their tools and equipment and use them properly, injuries, loss of efficiency, and damage to materiel or facilities will result. All personnel should familiarize themselves with the tools and equipment they use. This information may be obtained from appropriate training manuals or training bulletins. A repairman, prior to undertaking the repair of items which are unfamiliar to him, should refer to the appropriate publication in order to determine any special precautions that should be taken. If necessary, the supervisor should be consulted on any points in question.

b. The properties and characteristics of gasoline make it one of the greatest potential hazards in any organization. All personnel should be familiar with the precautions to be taken in handling gasoline. These precautions are explained in TM 10-1101.

c. Many of the items with which ordnance personnel may come in contact are potentially hazardous to personnel and equipment because of their chemical properties. Included in this group are those items which result in explosions or explosively rapid burning when combined with each other or with other substances which are relatively safe otherwise; those which are toxic or produce toxic fumes which result in damage to body tissues when inhaled, ingested, or brought into contact with the skin; and those which have a corrosive effect on material. Some items, especially the liquid propellants used in guided missiles, present a combination of these hazards. The precautions to

be used depend on the hazard involved. Some of the more dangerous items and the hazards they present are listed in table I. This list is merely a sample; it is not all inclusive. For additional hazards and detailed information on the precautions to be exercised in each case, see TM 9-1903 and the technical manual pertaining to the item of equipment or operation with which the hazardous item is associated.

Table I. Partial List of Hazardous Items

Item	Major Hazard
Anhydrous ammonia --	Gaseous concentrations are flammable and explosive. Caustic —produces burns on contact with the skin. Toxic when inhaled.
Aniline -----	Flammable and highly toxic by inhalation, ingestion, or absorption through the skin.
Carbon tetrachloride	Toxic through inhalation of vapors, by ingestion, or by absorption.
Furfuryl alcohol ----	Vapor concentrations may reach explosive limits.
Nitric acid -----	Extremely corrosive; produces toxic vapors; can cause serious damage to body tissues if adequate precautions are not taken.

d. In general, ordnance class II and IV supply and maintenance units are seldom required to deal with ammunition other than that used for items of individual or unit armament. However, items such as artillery and tanks moving rearward through evacuation channels may contain items of ammunition lodged in the gun tubes or lying loose in the hulls of the vehicles. More-

over, the ordnance park company, which issues artillery and vehicles, is also responsible for combat loading those items. Regardless of the fact that ammunition personnel are usually available to render the special handling necessary (in the case of evacuated items containing ammunition, assistance from the nearest ammunition installation is requested; in the case of combat loading, the park company has ammunition personnel assigned), all personnel must be familiar with the precautions to be used in handling ammunition. These precautions are covered in FM 9-5 and TM 9-1903.

e. The supply and maintenance of fire control equipment involves handling some electronic tubes which contain radioactive material, and others which are highly susceptible to implosion and the consequent scattering of fragments due to the high vacuum involved. In addition, the existence of extremely high voltages, the dangers posed by X-rays and radio frequency energy, and the presence of gases in some of these tubes present additional hazards to maintenance personnel. For these reasons, extreme care should be exercised in handling and storing these items, and, if an accident occurs, first aid should be administered promptly and correctly. For additional information on first aid and safety precautions, see FM 21-11 and technical manuals pertaining to the equipment being handled.

f. Personnel and vehicles should avoid contact with aerial or underground communication and power lines. Many power lines associated with Signal Corps equipment carry high voltages and are extremely dangerous to inexperienced personnel who attempt to cut or move the lines. In addition, the destruction of communication or power lines may disrupt important signal networks.

APPENDIX I

REFERENCES

1. Army Regulations

The DA Pam 310-series should be checked frequently for latest changes or revisions to publications relating to material covered in this manual.

1-65	Work Simplification.
220-60	Battalions, Battle Groups, Squadrons; General Provisions.
220-70	Companies, General Provisions.
320-5	Dictionary of United States Army Terms.
320-50	Authorized Abbreviations and Brevity Codes.
345-5	Personnel Management; Personnel Records.
385-10	Army Safety Policy.
611-201	Manual of Enlisted Military Occupational Specialties.
611-202	Manual of Enlisted Military Occupational Specialties (Classified).
700-5	Organization and Operation of Inventory Control Points.
700-39	Electronic Failure Reports (Reports Control Symbol CSGLD-803).
711-16	Installation Stock Control and Supply Procedures.
725-950	Local Purchase and Requisitioning of Ordnance Expendable Items (Except for Ammunition and Guided Missiles).
735-35	Supply Procedures for TOE Units, Organizations, and Non-TOE Activities.
750-5	Maintenance Responsibilities and Shop Operation.
750-8	Command Maintenance Inspections.
750-15	Maintenance Readiness and Field Maintenance Costs (Reports Control Symbol CSGLD-931).
750-925	Spot Check Inspection and Reports; Ordnance Corps Materiel.

2. Special Regulations

310-30-15	Organization and Equipment Authorization Tables; Personnel.
605-105-5	Commissioned and Warrant Officer Personnel Military Occupational Specialties.
605-105-6	Commissioned and Warrant Officer Personnel Military Occupational Specialties (Classified Series).
715-110-50	Authorization for Local Purchase of Ordnance Supplies and Materials.

3. Field Manuals

5-20	Camouflage, Basic Principles and Field Camouflage.
5-21	Camouflage of Fixed Installations.
5-22	Camouflage Materials.
9-1	Ordnance Service in the Field.
9-3	Ordnance Direct Support Service.
9-5	Ordnance Ammunition Service.
19-40	Handling Prisoners of War.
21-5	Military Training.
21-6	Techniques of Military Instruction.
21-11	First Aid for Soldiers.
21-30	Military Symbols.
21-40	Small Unit Procedures in Atomic, Biological, and Chemical Warfare.

- 21-41 Soldier's Handbook for Nuclear, Biological, and Chemical Warfare.
- 21-48 CBR Training Exercises.
- 22-100 Military Leadership.
- 24-18 Field Radio Techniques.
- 24-20 Field-Wire Techniques.
- 25-10 Motor Transportation, Operations.
- 27-10 The Law of Land Warfare.
- 31-15 Operations Against Airborne Attack, Guerilla Action and Infiltration.
- 100-10 Field Service Regulations; Administration.
- 101-5 Staff Officers' Field Manual; Staff Organization and Procedure.

4. Technical Manuals

- 9-1005 Instruction Guide: Ordnance Preservation, Packaging, Packing, Storage, and Shipping.
- 9-1903 Care, Handling, Preservation, and Destruction of Ammunition.
- 9-2810 Tactical Motor Vehicle Preventive Maintenance, Supply, Inspection, and Training Procedures.
- 10-405 Army Mess Operations.
- 10-415 Operation of Garrison Mess Equipment.
- 10-1101 Petroleum-Handling Operations.
- 19-500 Enemy Prisoners of War.
- 743-200 Storage and Materials Handling.
- 743-200-1 Storage and Materiels Handling.

5. Supply Bulletins

- 9-48 Production Control Procedure for Automotive Shops.
- 9-156 Ordnance Operational List of Specifications and Instructions for Packaging and Processing General Supplies.

6. Army Training Programs

- 9-201 Army Training Program for Ordnance of the Field Army.
- 9-302 Army Training Program for Ordnance Service Type Units.
- 20-5 Army Training Program for Field Exercises and Maneuvers.

7. Department of the Army Pamphlets

- 20-300 Techniques of Work Simplification; More Effective Use of Manpower, Equipment, Materials, Space.
- 27-1 Treaties Governing Land Warfare.
- 108-1 Index of Army Motion Pictures, Film Strips, Slides, and Phono-Recordings.
- 310-1 Index of Administrative Publications (Army Regulations, Special Regulations, Department of the Army Pamphlets, Commercial Traffic Bulletins, Military Traffic Management Bulletins, General Orders, Bulletins, and Circulars).
- 310-2 Index of Blank Forms.
- 310-3 Index of Training Publications (Field Manuals, Reserve Officers' Training Corps Manuals, Training Circulars, Army Training Programs and Mobilization Training Programs, Army Subject Schedules, Army Training Tests, War Department and Department of the Army Posters, and Firing Tables and Trajectory Charts).
- 310-4 Index of Technical Manuals, Technical Bulletins, Supply Bulletins, Lubrication Orders, and Modification Work Orders.
- 310-7 Index of Tables of Organization and Equipment, Tables of Organization, Type Tables of Distribution, and Tables of Allowances.
- 310-29 Index of Supply Manuals—Ordnance Corps.
- 690-80 Administration of Foreign Labor During Hostilities.

APPENDIX II

ORDNANCE GENERAL AND DEPOT SUPPORT UNITS

1. General

This appendix contains general information on the mission, assignment, capability, mobility, and organization of general and depot support units. Both existing and proposed TOE units have been included. It should be noted, however, that TOE's are subject to frequent revision. Moreover, as additional requirements develop or the need for specific services ceases to exist, new TOE organizations come into being and others are either eliminated or modified. When utilizing this appendix, the ordnance planner should note any TOE changes reflected in DA Pamphlet 310-7, and make allowances therefor. Proposed TOE's are identified by an asterisk.

2. Companies, Battalion Headquarters Detachment, and Group Headquarters Detachment

a. *Ordnance General Support Company, TOE 9-9D (Mar 59).*

(1) *Mission.* To provide general support field maintenance for full track and

combat vehicles, artillery, small arms, and instruments, and to provide limited reconditioning support on a non-assembly line basis, within the extent of its capabilities, for unserviceable, reclaimable track vehicle and artillery components and assemblies for return to supply channels.

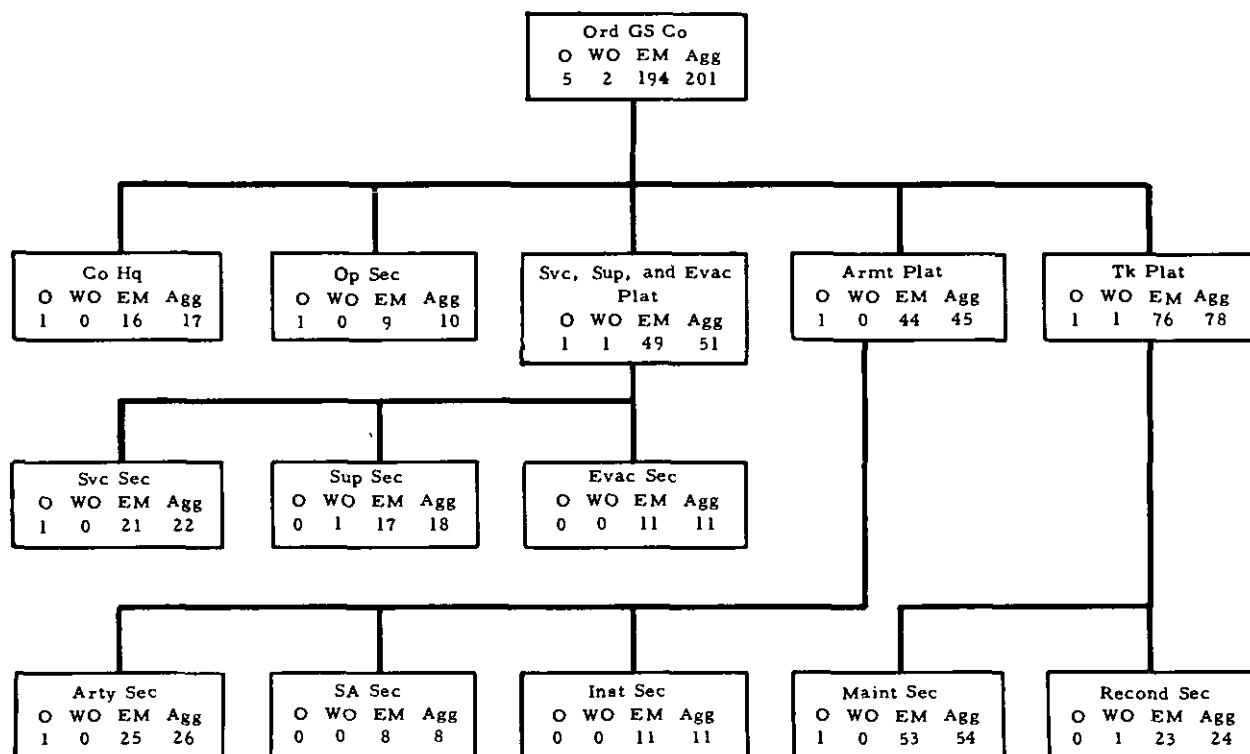


Figure 10. Ordnance General Support Company, TOE 9-9D.

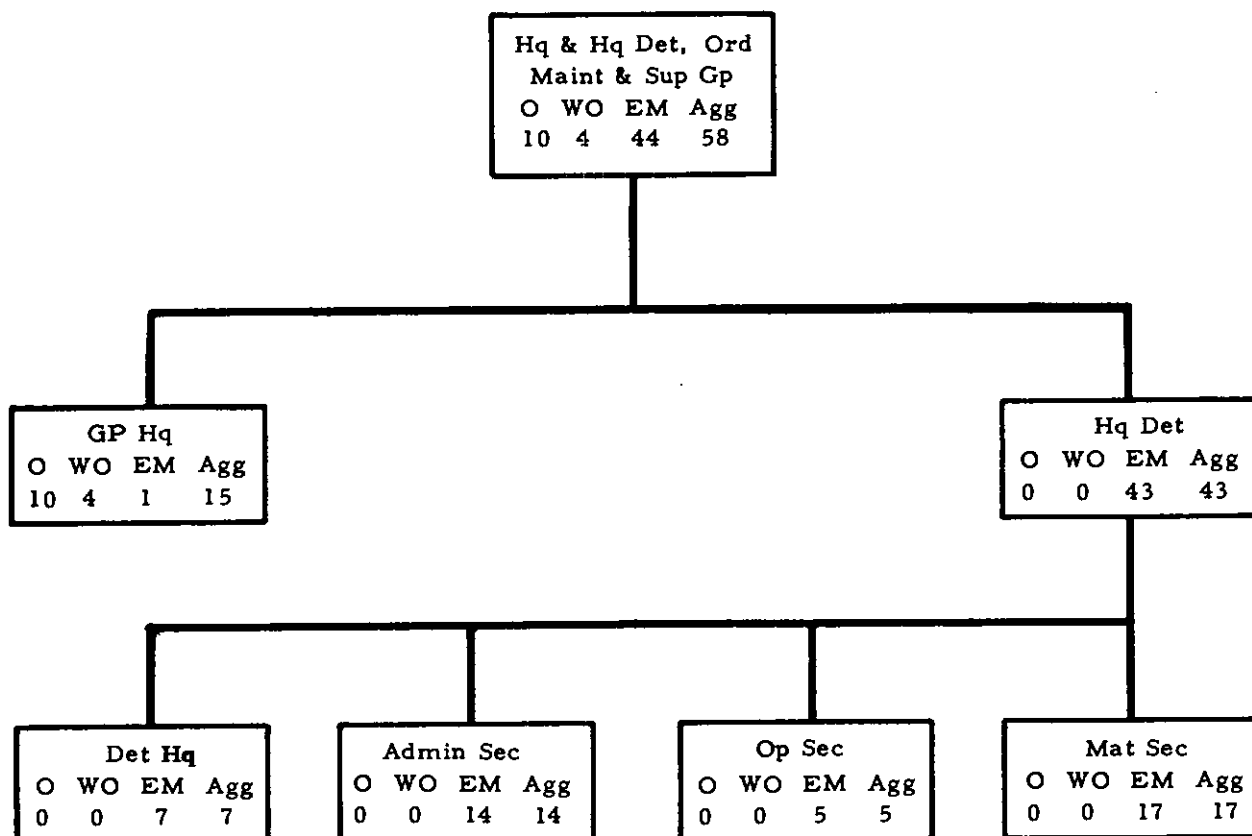


Figure 11. Headquarters and Headquarters Detachment, Ordnance Maintenance and Supply Group, TOE 9-12D.

(2) *Assignment.* Assigned to field army, communications zone, or independent corps.

(3) *Capabilities.* Can support 2,646 automotive equivalents (track vehicle); 672 artillery equivalents; 23,520 small arms equivalents; and 9,450 instrument equivalents. In addition, it is capable of limited reconditioning of 100 track vehicle components and assemblies and 30 artillery components in any 30-day period.

(4) *Mobility.* Fifty-five percent.

(5) *Organization.* See figure 10.

b. *Headquarters and Headquarters Detachment, Ordnance Maintenance and Supply Group, TOE 9-12D (Feb 58).*

(1) *Mission.* To provide tactical, technical, and administrative command of ordnance troops.

(2) *Assignment.* To field army, independent corps, or communications zone.

(3) *Capabilities.* Provides command, control, staff planning, and supervision of three to five ordnance battalions.

(4) *Mobility.* Sixty-five percent.

(5) *Organization.* See figure 11.

c. *Ordnance Field Supply Company, TOE 9-57R (Apr 55).*

(1) *Mission.* Receipt, storage, and issue of ordnance class II and IV general supplies and equipment included in a field army, except wheel and track vehicles and artillery.

(2) *Assignment.* Normally assigned to field army or independent corps. May be assigned to a communications zone.

(3) *Capabilities.* Supports a balanced force of all arms, furnishing class II and IV ordnance supply (except vehicles and artillery) for approximately 25,000 troops of a field army.

(4) *Mobility.* Fifty percent.

(5) *Organization.* See figure 12.

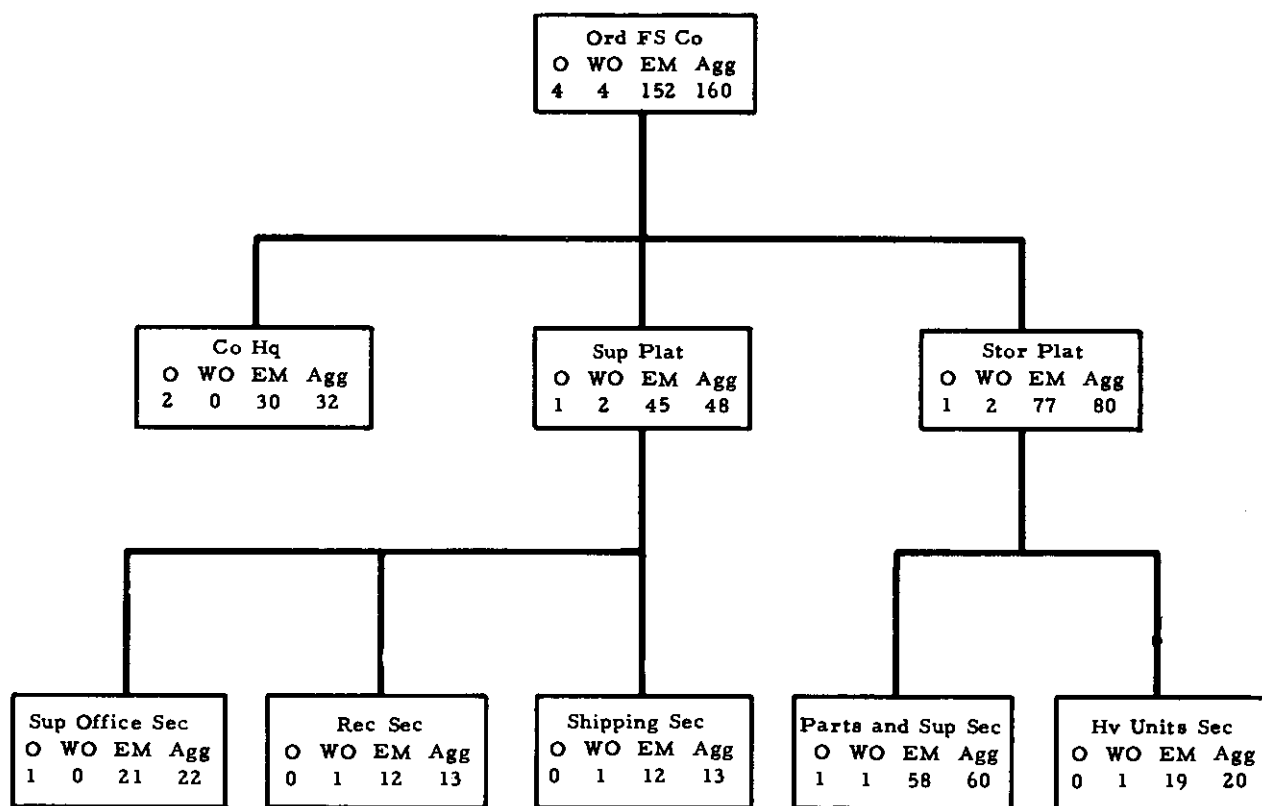


Figure 12. Ordnance Field Supply Company, TOE 9-57R.

d. *Headquarters and Headquarters Detachment, Ordnance Maintenance and Supply Battalion, TOE 9-76D (Mar 59).*

- (1) *Mission.* To provide command, administrative, technical, and operational supervision for ordnance maintenance and supply companies.
- (2) *Assignment.* To field army, communications zone, or independent corps. This unit is normally attached to a Headquarters and Headquarters Detachment, Ordnance Maintenance and Supply Group, TOE 9-12D.
- (3) *Capabilities.* Performs the above mission for three to seven ordnance companies.
- (4) *Mobility.* Sixty-five percent.
- (5) *Organization.* See figure 13.

e. *Ordnance Park Company, TOE 9-137D (Jan 58).*

- (1) *Mission.*
 - (a) To receive, store, maintain in storage, prepare for issue, and issue end

items of wheel and track vehicles and artillery (towed and self-propelled) to army or communications zone units or as otherwise assigned.

- (b) To stock necessary quantities of items of other services essential for combat loading and to combat load all vehicles when operating in the field army area.

- (2) *Assignment.* To field army or communications zone.

- (3) *Capabilities.* At full strength this unit has the following capabilities—

- (a) Operates a park of 3,600 automotive equivalents or 1,800 gas-consuming vehicles of which 40 percent may be combat vehicles with a proportionate number of trailers, and 135 artillery pieces (including SP).
- (b) In each 30-day period it is capable of performing all operations incident to the issue of 1,800 vehicles and 135 artillery pieces (including SP).

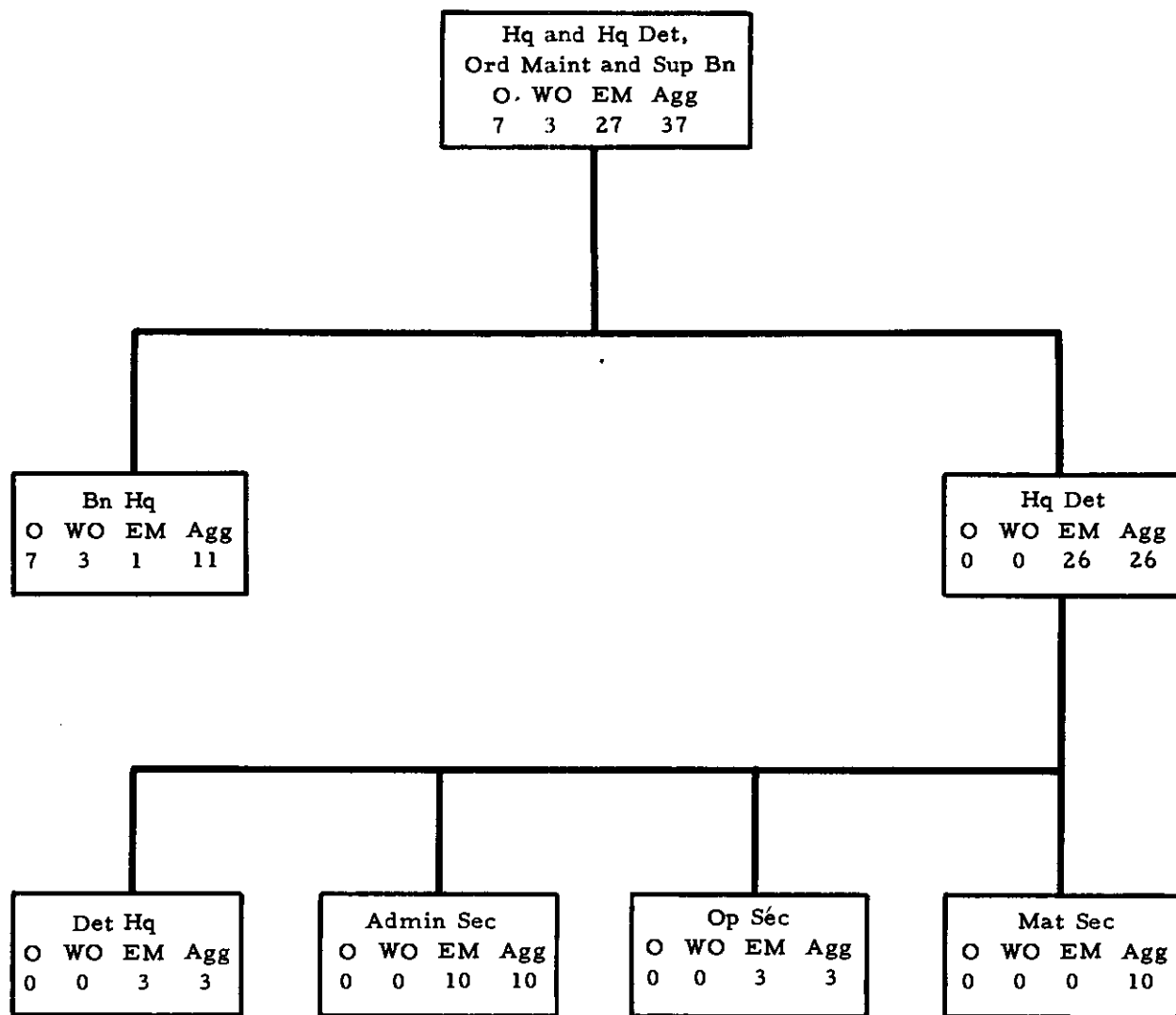


Figure 13. Headquarters and Headquarters Detachment, Ordnance Maintenance and Supply Battalion, TOE 9-76D.

- (c) Each storage platoon can support one-third of the above capabilities when operating with the unit or when operating apart from the company and attached to another unit.
- (d) When operating in one location in the communications zone, augmented by sufficient auxiliary personnel, the capabilities of the company can be increased 100 percent.

(4) *Mobility*. Seventy percent.

(5) *Organization*. See figure 14.

f. *Ordnance Recovery and Classification Company, TOE 9-167R (Mar 55)*.

(1) *Mission*. To establish and operate col-

lection points within the field army service area for the receipt and classification of unserviceable ordnance general supplies and similar captured enemy materiel; to ship them to maintenance facilities as required; to augment battlefield recovery and evacuation facilities organic to tactical units or ordnance direct support units.

(2) *Assignment*. Normally assigned to the field army service area. May be attached to Headquarters and Headquarters Detachment, Ordnance Battalion, TOE 9-76D.

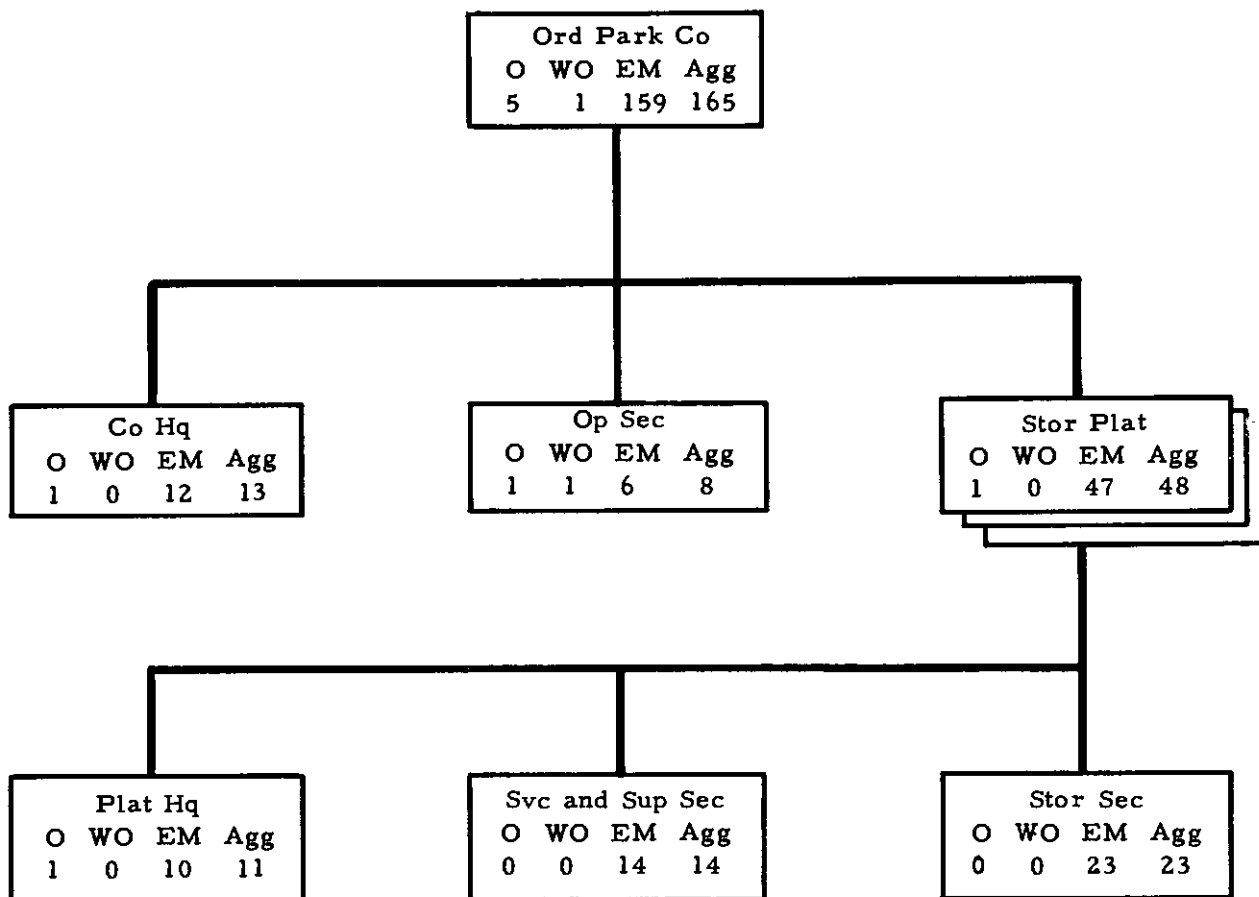


Figure 14. Ordnance Park Company, TOE 9-137D.

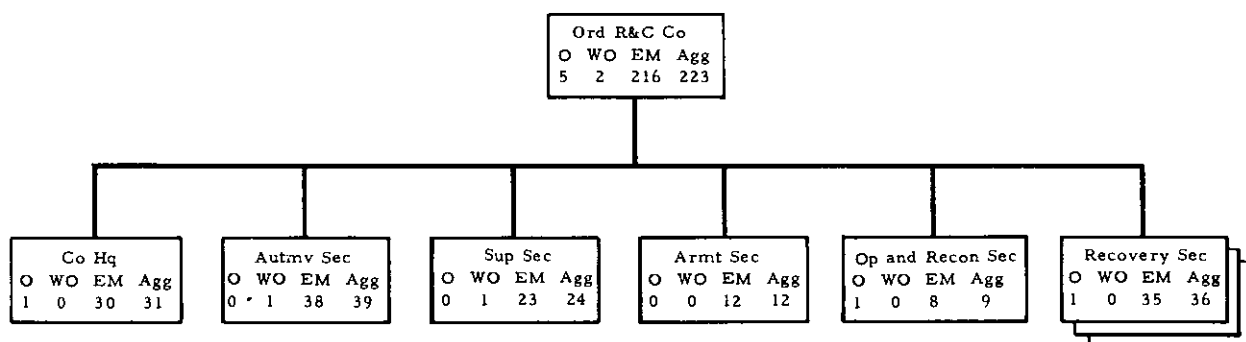


Figure 15. Ordnance Recovery and Classification Company, TOE 9-167R.

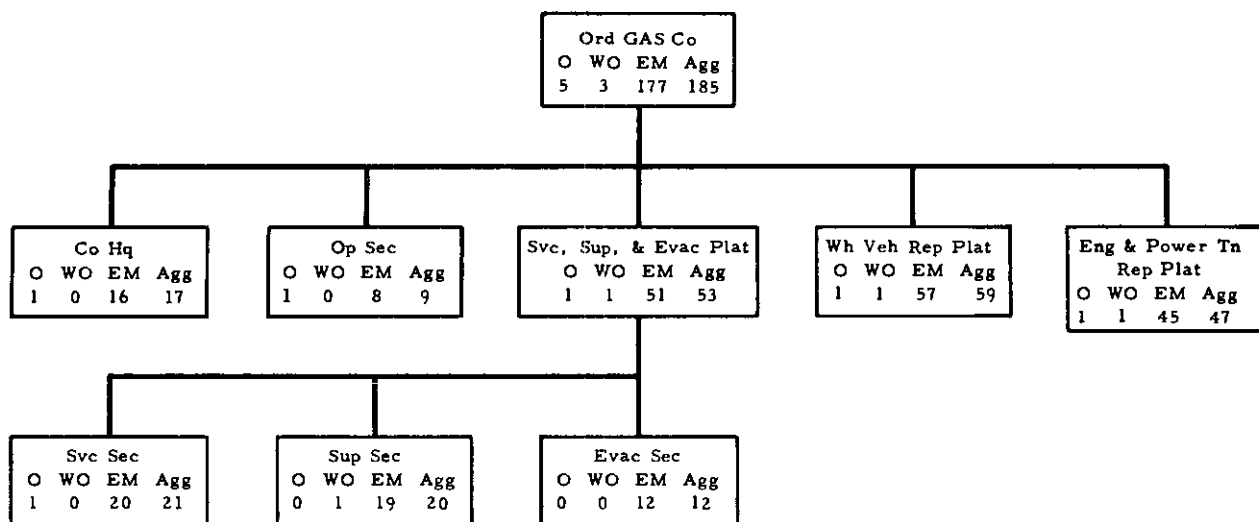


Figure 16. Ordnance General Automotive Support Company, TOE 9-197D.

- (3) *Capabilities.* Provides support as stated above.
- (4) *Basis of allocation.* One per corps or equivalent army troops.
- (5) *Mobility.* One hundred percent.
- (6) *Organization.* See figure 15.

g. *Ordnance General Automotive Support Company, TOE 9-197D (Mar 59).*

- (1) *Mission.* To provide general support field maintenance for wheel vehicles and trailers, and to provide limited reconditioning support on a nonassembly line basis, within the extent of its capabilities, for unserviceable, reclaimable wheel vehicle components and assemblies for return to supply channels.
- (2) *Assignment.* Assigned to field army, communications zone, or independent corps.
- (3) *Capabilities.* Supports 2,862 automotive equivalents (wheel vehicle). In addition, it is capable of limited reconditioning of 125 to 150 wheel vehicle engines, 625 power train components, and 1,800 fuel and electrical system assemblies in any 30-day period.
- (4) *Mobility.* Fifty percent.
- (5) *Organization.* See figure 16.

h. *Ordnance Guided Missile General Support Company, TOE 9-227D (Mar 59).*

- (1) *Mission.* To provide general support maintenance in a theater of operations for all nonexplosive components of the NIKE and CORPORAL missiles and all ordnance materiel of the ground guidance, launching, and handling equipment not allied with automotive or conventional mechanical equipment.
- (2) *Assignment.* Assigned to a field army or communications zone.
- (3) *Capabilities.* Provides backup general support maintenance for five to six NIKE direct support detachments and two to three CORPORAL direct support detachments.
- (4) *Mobility.* Fifty percent.
- (5) *Organization.* See figure 17.

i. *Ordnance Tire Rebuild Company, TOE 9-347R (Apr 55).*

- (1) *Mission.* To receive, inspect, classify, and repair or rebuild all types and sizes of unserviceable pneumatic tires and tubes (except rebuild of earth-mover type tires) for return to depot stocks.
- (2) *Assignment.* Normally assigned to the communications zone, to an ordnance battalion engaged in rebuild activities.
- (3) *Capabilities.* Capable of retreading 260 tires and making 304 sectional repairs each 24 hours.

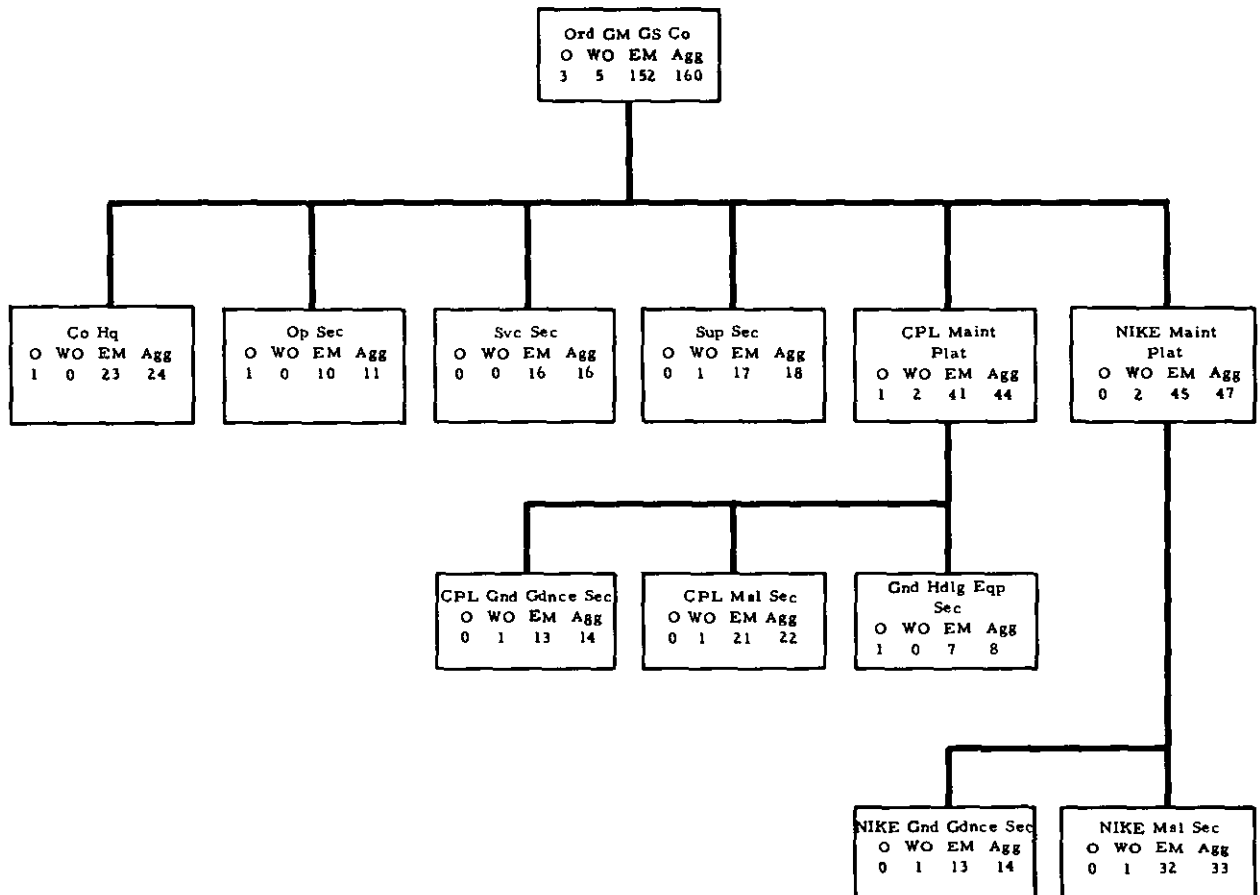


Figure 17. Ordnance Guided Missile General Support Company, TOE 9-227D.

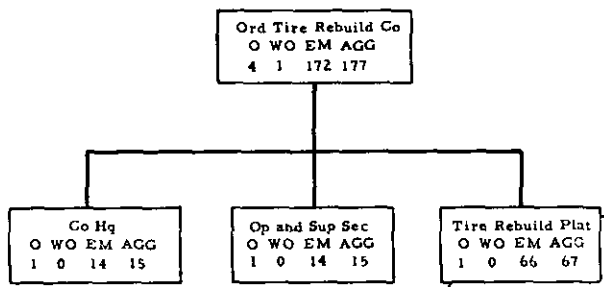


Figure 18. Ordnance Tire Rebuild Company, TOE 9-347R.

- (4) *Mobility.* Fixed.
 (5) *Organization.* See figure 18.

j. *Ordnance Collecting Point Company, TOE 9-358R (Apr 55).*

- (1) *Mission.* Establishment of collecting points within the communications zone for the receipt, classification, disassembly, preservation, and disposition as directed of ordnance materiel re-

ceived from communications zone maintenance channels or from field army collecting points.

- (2) *Assignment.* Assigned to the communications zone. Normally attached to an Ordnance Battalion, TOE 9-76D.

- (3) *Capabilities.*

- (a) Performs its mission in support of 22,000 end items of automotive and artillery materiel in the theater, based on end item equivalents.

- (b) Capable of operating two collecting sites for a limited period of time.

- (4) *Mobility.* Thirty percent.

- (5) *Organization.* See figure 19.

k. *Ordnance Supply Depot Company, TOE 9-367R (Apr 55).*

- (1) *Mission.* To establish and operate ordnance class II and IV supply depots for distribution to combat zone sup-

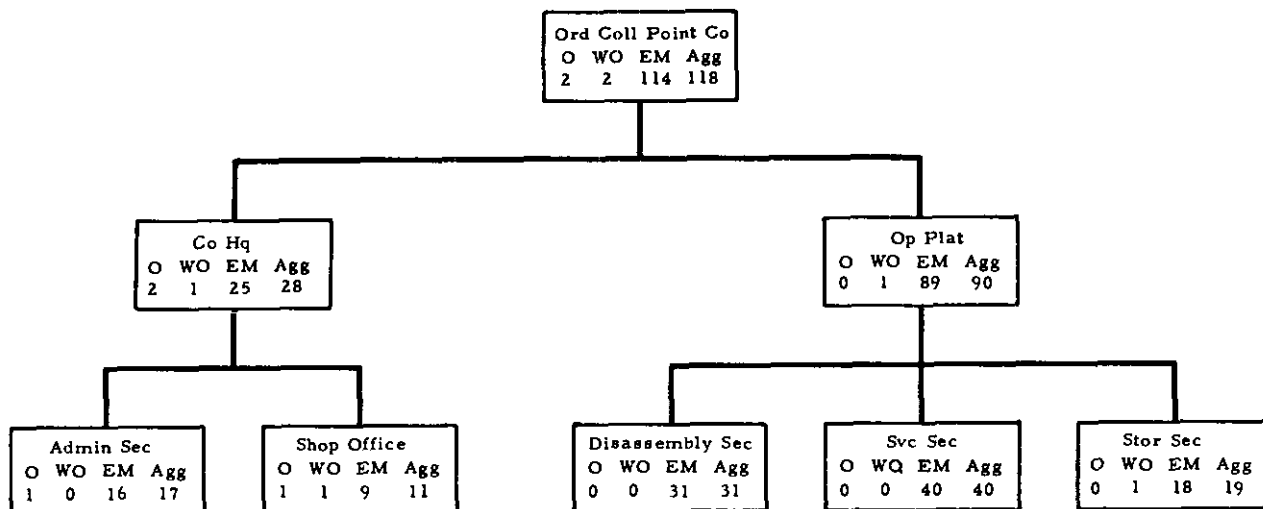


Figure 19. Ordnance Collecting Point Company, TOE 9-358R.

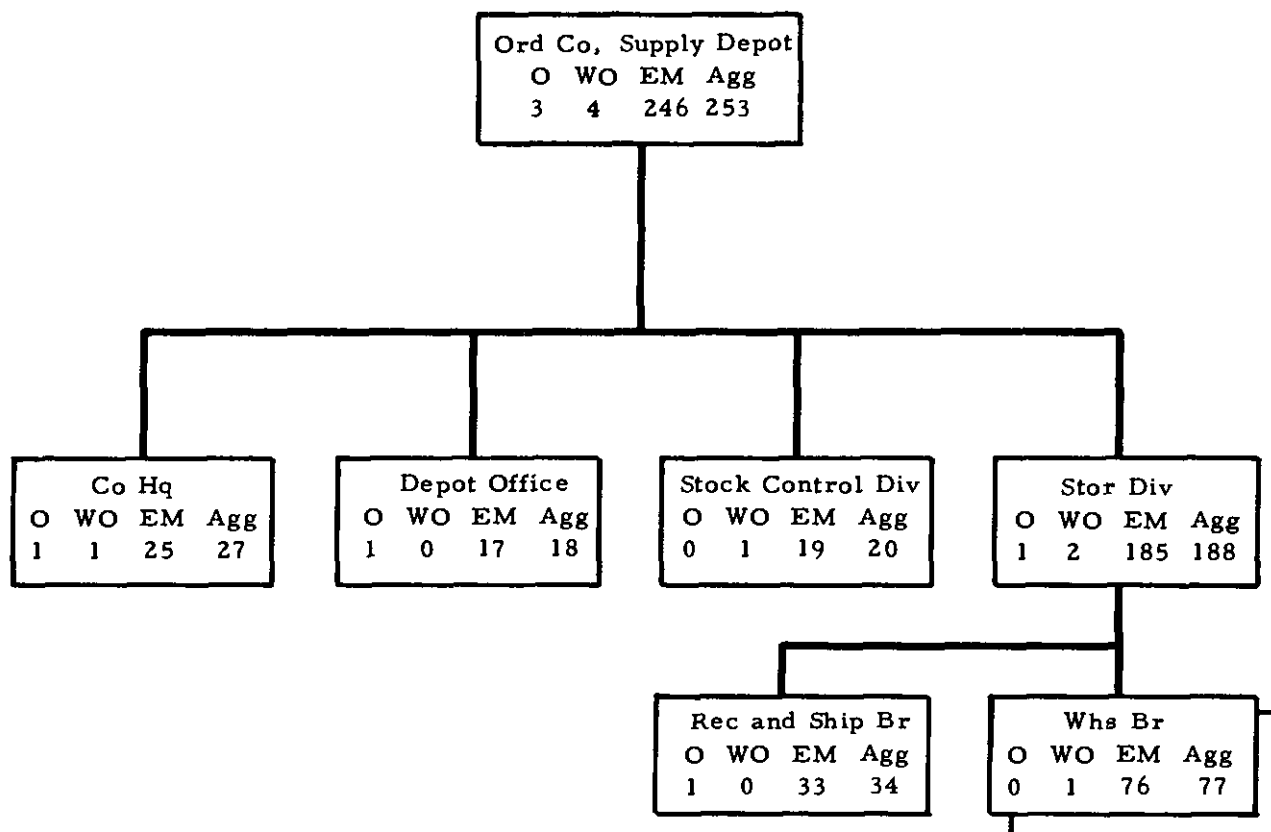


Figure 20. Ordnance Supply Depot Company, TOE 9-367R.

ply installations, and storage and distribution within the communications zone.

(2) *Assignment.* To the communications zone as needed.

(3) *Capabilities.* Can issue or ship 170

short tons of ordnance class II and IV supplies per day and concurrently perform all of the operations incident to the receipt and storage thereof.

(4) *Mobility.* Fifteen percent.

(5) *Organization.* See figure 20.

3. Teams and Detachments Having General or Depot Support Capabilities
See tables II and III.

Table II. Ordnance Service Organization, TOE 9-500R

Team	Title	Support role	Mission, capability, or basis of assignment	TOE personnel
AA	Platoon headquarters, component	All	Command	2
AB	Platoon headquarters, separate	All	Command	4
AC	Company headquarters	All	Command	9
BA	General supply, basic	All	10 Short tons per day	16
BB	General supply, augmentation	All	Augment team BA, 10 short tons per day.	14
BE	Recovery	DS-GS	Support 15,000 troops	22
CD	Tire repair	GS	Support 50,000 troops	17
EA	NIKE general support	GS	Support 4 NIKE detachments FA (TOE 9-510R).	45
EB	CORPORAL general support	GS	Support 1 to 2 CORPORAL detachments, FB (TOE 9-510R).	43

Table III. Ordnance Specialized Service Detachments, TOE 9-510R

Detachment	Title	Support role	Mission, capability, or basis of assignment	TOE personnel
AA	Explosive disposal	All	8 per field army	10
AB	Explosive disposal, augmentation	All	1 per 8 detachments AA	14
AC	Explosive disposal, control	All	(See TOE)	8
BA	Ballistic and technical service	All	(See TOE)	7
BB	Technical intelligence	All	1 per field army	6
BC	Technical intelligence, control	All	1 per corps	
CA	Heavy anti-aircraft artillery repair	DS-GS	1 per field army or 1 per 6-8 detachments BB.	11
CB	Heavy anti-aircraft artillery repair, augmentation.	DS-GS	1 per 3 heavy AAA battalions	9
CC	Integrated fire control repair, M-33	DS-GS	1 per each AAA battalion over 3 assigned to detachment CA.	2
CD	Integrated fire control repair, M-38	DS-GS	1 per 12 sets M-33	13
CE	Integrated fire control repair, M-33, augmentation.	DS-GS	1 per 18 sets M-38	11
EB	Stock control	Depot	1 per each 4 sets M-33 over 12 assigned to detachment CC.	4
			1 per theater	34

APPENDIX III

SAMPLE EVACUATION INSTRUCTIONS

HEADQUARTERS
11th ORDNANCE GROUP
APO 4 U. S. ARMY

21 July 1960

SUBJECT: Evacuation of Ordnance Materiel

TO: Commanding Officer
14th General Support Battalion
Fifteenth U. S. Army

As directed by Administrative Order No. 6, Headquarters, Fifteenth U. S. Army, all unserviceable U. S. and foreign ordnance materiel will receive disposition by the 886th Recovery and Classification Company as follows:

1. Materiel classified for repair by general support will be job ordered to the following units:

- a. 801st GS Co.
- b. 820th GAS Co.
- c. 822d GAS Co.

2. Materiel beyond the capability or capacity of these units will be evacuated to the 19th Ordnance Bn (M&S).

3. Materiel classified for depot maintenance will be evacuated directly to the 7th Ordnance Bn (Depot).

4. All materiel classified for zone of interior rebuild will be turned over to the transportation officer for shipment as follows:

- a. Armament:
Commanding Officer
U. S. Army Ordnance Arsenal, Rock Island
Rock Island, Illinois
- b. Automotive:
Commanding Officer
U. S. Army Ordnance Arsenal, Detroit
Detroit, Michigan
- c. Guided Missiles:
Commanding Officer
U. S. Army Ordnance Arsenal, Redstone
Huntsville, Alabama

5. Foreign materiel will be evacuated as directed by 68th Ordnance Detachment, Technical Intelligence.

6. Needed reparable components will be reclaimed from uneconomically reparable end items, and will be job ordered to the general support units listed in paragraph 1 above for repair and return to supply channels.

7. Repaired end items from maintenance units of this headquarters will be returned to supply channels.

8. Residue of unserviceable materiel and uneconomically reparable materiel will be disposed of through quartermaster disposal channels.

I. WILL SALVAGE
Colonel, Ord Corps

APPENDIX IV

SHOP RECORDS AND REPORTS

1. General

Records and reports are an integral part of the general support unit's maintenance shop operation. Certain records and reports are necessary to notify personnel of the work to be done, to inform key personnel on the status of work, to maintain supplies at a level which will sustain maintenance operations, and to keep commanders informed. The principal records and reports common to the operating of a general support unit are listed in this appendix. Note that all the forms discussed will not be applicable to each unit; some will be used by supply units, and others by maintenance units. Moreover, additional records and reports may be required by higher headquarters. All unnumbered forms will be reproduced locally under provisions of AR 310-1.

2. Work Request and Job Order, DA Form 811 (fig. 21)

a. The DA Form 811 is both a work request and a job order. It furnishes the necessary information as to what work is to be performed on a particular item or items of materiel. When completed, it serves as a record of the maintenance that has been performed on equipment.

b. The work request portion of this form contains a description of the work requested and is prepared in four copies by the individual or organization requesting the work. All copies of the DA Form 811 are presented to the control office. A separate DA Form 811 will be prepared for each large end item received from a direct support unit. One form, however, may be used to request work on a number of like assemblies or smaller items. Similarly, collecting points will usually prepare one work request for a group of like items.

c. The job order portion of the form specifies the nature of the work to be performed in

the maintenance unit's shops, and indicates the routing of work through the shops. This portion of the form is completed by the initial inspector and the control office. Whereas the work request portion of the DA Form 811 is general in that it requests a certain end result such as repair of an engine, the job order lists specific actions that must be accomplished by designated shop sections to accomplish the repair. Figure 22 illustrates how the DA Form 811 and accompanying paperwork are routed through a general support maintenance company's shop. In order to protect the forms used and to preserve their legibility, paperwork routed through the shop is placed in a grease-proof envelope (nosebag).

3. Supply Records

a. All of the forms indicated below are not applicable to all general support units. The particular forms used depend on whether formal or informal accountability is being maintained and whether the technical mission of the unit is one of maintenance or supply. For information on the forms applicable in each case, a description of the forms, and procedures regarding their use, see AR's 711-16 and 735-35. These regulations also contain information on the forms used to make stock record adjustments (DA Form 444, Inventory Adjustment Report; DD Form 200, Report of Survey).

- (1) *Request for Issue or Turn-In, DA Form 1546.* This is a seven-part form used by supply sections to initiate a demand or turn-in for a single item.
- (2) *Title Insert, DA Form 1297.* The title insert is a single part form which provides spaces for the stock number, FIA code, description, location, authorized stock level, "Remarks," and

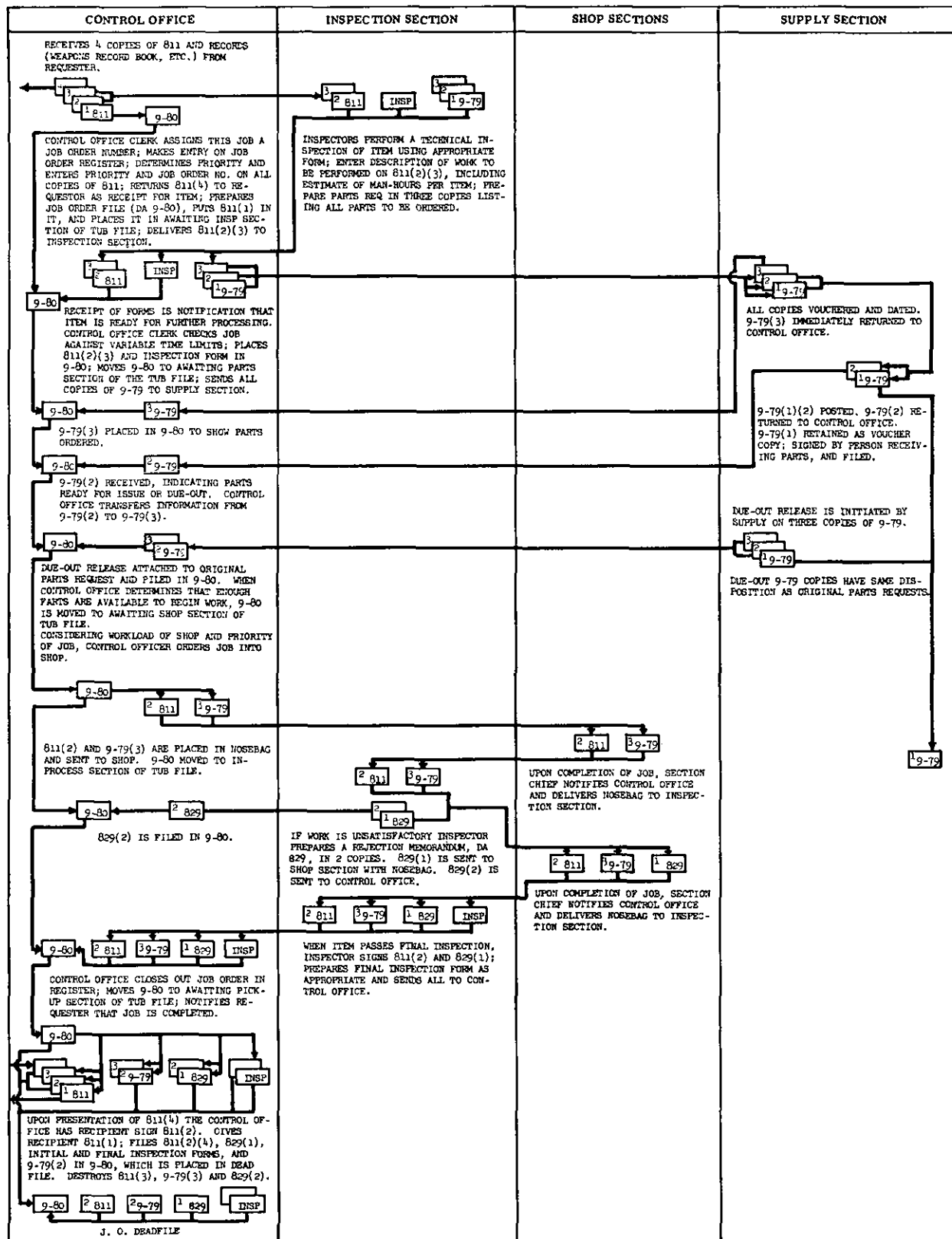


Figure 22. Job order flow chart.

other appropriate data. It will be prepared and inserted in the visible file for all repair parts authorized for stockage at the using unit or organization only upon the original demand for these items.

- (3) *Change Card, DA Form 1545.* This card is used to indicate a stock number change of an item. The old stock number is entered in the upper portion of the card, and the new number in the lower portion. The card is inserted in the visible file in front of the title insert bearing the old stock number.
- (4) *Stock Accounting Record, DA Form 1296.* This is an accounting form on which to record transactions affecting the status of an individual item.
- (5) *Demand Data Card, DA Form 1300.* This is a prepunched and interpreted EAM card on which to record stock control quantitative elements for the computation of requisitioning objectives and requirements or excesses and to record due-in and followup action on replenishment requisitions or excess reports. This card provides a method of transmitting demand data to the agency prescribed by the heads of technical services.
- (6) *Due-Out Card, DA Form 1298.* This form is used to record obligations to other activities or installations.
- (7) *Due-In Card, DA Form 1299.* This is used to record anticipated receipts other than those recorded on the demand data card.

b. The Parts Requisition, DA Form 9-79 (fig. 23) is used to list all the requirements for repair parts to accomplish repair of the item or items listed on the DA Form 811. It is prepared by the inspector, the shop clerk, or both, based on the requirements indicated as a result of initial inspection. This form is submitted to the supply section for issue action.

4. Job Order File, DA Form 9-80

This is an envelope which is used in the control office to hold the appropriate copies of DA

Form 811 and other records pertinent to materiel while work progresses through the shops. When DA Form 9-80 is not available, any suitable envelope may be used. The various job order envelopes are kept in appropriate locations of the tub file corresponding to the work to which they pertain.

5. Daily Summary of Operations (fig. 24)

Each shop section is responsible for reporting a summary of its daily operations to the office. The summary of operations reflects the activity of the shop section. It indicates backlog from previous days, the number of items received, the number completed, the balance of work on hand, the number of job orders closed out, and the percentage of the monthly maintenance load completed to date. Summaries of operations are prepared by section foremen, after which they are checked and submitted to the control office through the respective shop officers. A sample format is shown in figure 24.

6. Job Order Register See appendix V.

7. Unsatisfactory Equipment Report, DA Form 468

a. The Unsatisfactory Equipment Report, DA Form 468, is provided as a means of direct communication between the equipment user and the chief of the technical service responsible for the design of the equipment. The unsatisfactory equipment report (UER) is used to advise the chief of the technical service of equipment failures resulting principally from faulty design or manufacture.

b. The UER may be filled out by anyone, signed by the officer responsible for the use or maintenance of the equipment (such as motor officer, company commander, or platoon leader) and two copies are mailed directly (not through channels) to the chief of the technical service. In the case of ordnance equipment, UER's are mailed directly to—

Office, Chief of Ordnance
ATTN: ORDFM
Washington 25, D. C.

DA FORM 9-79 Replaces DA AGO Form 9-79, 8 June 1944, which may be used.
FEB 50 (Formerly DA AGO) (FOLD TO INSERT IN 1" x 5" FILE) 16-32049-4 U. S. GOVERNMENT PRINTING OFFICE : 1955-O-326771

AGO 2484A

SECTION _____ ORDNANCE COMPANY _____

AS OF _____ HOURS _____ 19 _____

1	2	3	4	5	6	7
ITEM	BACKLOG PREVIOUS DAY	REC TODAY	COMPLETED TODAY	BALANCE	JOB ORDERS CLOSED OUT	% TO DATE
TOTALS						

Figure 24. Daily Summary of Operations (sample).

FUNCTION: MACHINE SHOP

[illegible]

Figure 25. Group labor record (sample).

c. The form is self-explanatory. It is important, however, to remember that the completed form will be only as effective as the information entered thereon. It is essential, therefore, that each form be as complete as possible and every known detail be provided so that the technical service has sufficient data to evaluate the failure reported.

8. Guided Missile Component Evaluation Data Report, DA Form 9-110

This form is used to report failure of individual guided missile components (electronic, mechanical, hydraulic, etc.). This form is related to DA Form 468 (Unsatisfactory Equipment Report). A separate report will be submitted for each failure that occurs. AR 700-37 fully explains the procedures to be followed in using this form.

9. Group Labor Record (fig. 25)

Each supervisor or foreman responsible for one or more functions will initiate a group labor record for each function, using a form similar to the one shown in figure 25. This form lists all the personnel assigned to the section making the report, together with the total number of man-hours devoted to each function per day and the number of personnel employed in each function. When used correctly, this form will provide a comparison between the total number of men available to each section and the total number of men employed in accomplishment of the section's functions. The percentage which results is an indication of the effective utilization of personnel within the section. Individual forms from all sections of the company are consolidated by the control office for submission to higher headquarters.

10. Quarterly Maintenance or Spot Check for Wheeled Vehicles—Wheeled Trailers, DA Form 461 (fig. 26)

This form is used for the inspection of wheel vehicles and trailers entering or leaving ordnance shops. It is a checklist for the major functions of a vehicle. Columns are provided to show what the inspector determines is neces-

sary to repair the vehicle. When the form is to be used for a particular vehicle, the items which do not apply are crossed out. The inspection section prepares a DA Form 461 on each vehicle entering the shop.

11. Quarterly Maintenance or Spot Check for Tracked Vehicles—Tracked Trailers, DA Form 462

This form is identical in format and use to DA Form 461, except that it is designed and used for full-track vehicles only.

12. Quarterly Maintenance or Spot Check for Armament and Fire Control, DA Form 2146

This form is provided to maintenance personnel for recording spotcheck and technical inspections on armament and fire control equipment. It is prepared in the same manner as the DA Form 461.

13. Inspection Form for Small Arms (fig. 27)

A sample form for the inspection of small arms is shown in figure 27. This form should be locally reproduced.

14. Rejection Memorandum, DA Form 829

This form is used by the inspection section to reject an item on final inspection. An item is rejected when additional repairs are needed. The deficiencies which must be corrected are listed on the rejection memorandum.

15. Maintenance Readiness and Field Maintenance Card, DA Form 1510

This report is required by AR 750-15 once each quarter. It contains a complete summary of shop operations over that period of time. This summary requires so much detailed data on equipment supported, parts used, number of jobs completed, man-hours expended, etc., that procedures should be set up to accumulate this information continuously. Sources would be daily summaries of operations, job orders, group labor records, etc. Periodically, higher headquarters requires a report of all equipment deadlined in ordnance shops. Deadlined equipment should not include equipment which is undergoing preventive maintenance services;

QUARTERLY MAINTENANCE OR SPOT CHECK FOR WHEELED VEHICLES—WHEELED TRAILERS (TM 9-2810)					DATE 30 Oct 59
TYPE OF VEHICLE <i>Truck, 4-ton, 4x4</i>	REGISTRATION NUMBER <i>20390061</i>	MAKE <i>WILLEYS</i>	MODEL <i>M38</i>	MILEAGE <i>17173</i>	
UNIT <i>29th Signal Co.</i>	UNIT NUMBER <i>X-7</i>	DRIVER _____		APPLICABLE TM <i>9-8012</i>	
PART I. ITEMS WHICH SHOULD BE CHECKED BY ROAD TEST AND NECESSARY CORRECTIONS MADE DURING MAINTENANCE SERVICE <i>(Perform Before-Operation Service and check current work file.)</i>					
NO.	ITEM	ENTER DEFECTIVE ITEM OR DEFICIENCY	(Check appropriate column)		
			OK	REPAIR OR ADJUST	INITIAL IF DEFECT IS CORRECTED
1	DASH INSTRUMENTS*		✓		
2	SAFETY DEVICES*		✓		
3	ENGINE		✓		
	PERFORMANCE		✓		
	LINKAGE		✓		
	BELTS		✓		
	IGNITION		✓		
	COOLING SYSTEM		✓		
	ANTIFREEZE PROTECTION	<i>TO -20 DEGREES F.</i>	✓		
	EXHAUST SYSTEM		✓		
	FILTERS				
4	STEERING				
	MANUAL	<i>GREASE Seal Leaking</i>		⊗	<i>J.K.J.</i>
	POWER				
5	CLUTCH	<i>Clutch Disc Worn Out</i>		⊗	<i>J.P.J.</i>
6	AIR SYSTEM*				
7	BRAKES		✓		
	SERVICE		✓		
	PARKING		✓		
	TOWED LOAD CONTROLLER				
8	GENERATOR AND WIRING*		✓		
9	STARTER AND STARTER CONTROLS*		✓		
10	POWER TRAIN		✓		
	PROPELLER SHAFTS, U-JOINTS		✓		
	FRONT AXLE AND CV JOINTS	<i>CV Joints Worn</i>		⊗	<i>R.S.C.</i>
	REAR AXLE	<i>Ring Gear and Pinion Out</i>		⊗	<i>R.S.C.</i>
	SPRINGS		✓		
	SHOCK ABSORBERS	<i>Right Rear - Collapsed</i>		⊗	<i>R.S.C.</i>
	TRANSMISSION		✓		
	TRANSFER		✓		
11	LIGHTS AND REFLECTORS*		✓		
PART II. ITEMS NOT REQUIRING OPERATION OF THE VEHICLE ON WHICH NECESSARY CORRECTION WILL BE MADE DURING MAINTENANCE SERVICE					
NO.	ITEM	ENTER DEFECTIVE ITEM OR DEFICIENCY	(Check appropriate column)		
			OK	REPAIR OR ADJUST	INITIAL IF DEFECT IS CORRECTED
12	BATTERIES		✓		
13	FUEL SYSTEM		✓		
14	BODY AND BODY ACCESSORIES		✓		

*These items must operate correctly before the vehicle is driven on the road test.

DA FORM 461
1 AUG 58

PREVIOUS EDITIONS OF THIS FORM ARE OBSOLETE.
REPLACES DA FORM 9-59, 1 APR 54, WHICH IS OBSOLETE.

Front

Figure 26. Quarterly Maintenance or Spot Check for Wheeled Vehicles—Wheeled Trailers, DA Form 461 (sample).

NO.	ITEM	ENTER DEFECTIVE ITEM OR DEFICIENCY	(Check appropriate column)		
			OK	REPAIR OR ADJUST	INITIAL IF DEFECT IS CORRECTED
15	TOWING HITCHES		✓		
	LUNETTE AND SAFETY CHAINS		✓		
	KING PIN		✓		
	FIFTH WHEEL				
	LANDING GEAR				
	BREAKAWAY BRAKES				
	PINTLE		✓		
	AIR HOSE AND CONNECTORS				
	ELECTRICAL CABLES		✓		
16	FRAME AND BUMPER		✓		
17	WINCHES AND PDS				
18	HYDRAULIC SYSTEM				
19	BOOM AND CABLES				
20	JACKS AND OUTRIGGERS				
21	OVM AND STOWAGE		✓		
22	MOUNTED SPECIAL EQUIPMENT				
23	LUBRICATION BY LO		✓		
24	FINAL ROAD CHECK		✓		

PART III. CHECK THESE ITEMS ON AMPHIBIOUS VEHICLES

NO.	ITEM	ENTER DEFECTIVE ITEM OR DEFICIENCY	(Check appropriate column)		
			OK	REPAIR OR ADJUST	INITIAL IF DEFECT IS CORRECTED
25	BILGE PUMPS AND DRIVES				
26	RUDDER AND CONTROLS				
27	PROPELLER AND SHAFT				

REMARKS (Enter all items on which deficiencies noted were not corrected.)

ALL INSPECTIONS AND VEHICLE CONDITIONS RECORDED ON THIS FORM HAVE BEEN DETERMINED IN ACCORDANCE WITH DIAGNOSTIC PROCEDURES AND STANDARDS IN TM 9-8012

SIGNATURE (Mechanic)

Lt. L. H. Williams

SIGNATURE (Maintenance Officer)

William T. Bowers
1st Lt. 6rd Corps

U. S. GOVERNMENT PRINTING OFFICE: 1958 (1) - 475636

Back
Figure 26—Continued.

INSPECTION REPORT

Small arms

ORGANIZATION UNIT 'A' Co. 66TH TANK BN RESPONSIBLE OFFICER CAPT JOHN DOE PAGE 1

STATION APD 676 INSPECTED BY: 1st LT N.D. GIGG DATE 16 AUG 1950

Section I.
RIFLES, AUTOMATIC,

[illegible]

Section II.
GUNS, SUBMACHINE

[illegible]

Section III.
GUNS, MACHINE

[illegible]

Figure 27. Inspection form for small arms (sample).

[illegible][illegible][illegible]

Figure 27—Continued.

APPENDIX V

PRODUCTION CONTROL

1. Definition and Explanation

a. Production is accomplished by balancing the workload within the unit to eliminate overloads or underloads, by knowing the status and quantity of work in each of the shops in order to prevent bottlenecks, by controlling the quality of work performed by repairmen, and by improving operational procedures.

b. Overload conditions in any of the shop sections can seriously delay repair operations to the detriment of the unit's overall maintenance mission. These overload conditions can result from improper routing of work initially; the inability of repairmen to keep pace due to the influx of a large number of like jobs for any reason; or performing jobs that should have been evacuated. When overloads occur, corrective action should be taken to eliminate both the overload and, if possible, the factors contributing to it.

(1) The first step in the prevention of overloads is the adequate distribution of work among the various shop sections in a manner that will keep all sections working at or near capacity. This requires careful planning of the routing of jobs entering the shop.

(2) When overloads and underloads develop despite careful routing, the problem may be resolved by rerouting work or by supplementing the personnel strength of the overloaded section by the temporary addition of personnel from sections which are working below capacity. The shifting of personnel, however, must take into consideration individual capabilities. When personnel of a unit are cross-trained in several specialties, this becomes less of a problem.

(3) Rerouting is accomplished, when

necessary, to change the sequence of repair operations. This may involve movement of the item to another shop section or, if movement is impractical due to the partial disassembly of bulky equipment or other factors, repairmen from other sections may be moved to the job.

(4) If a lack of repair parts becomes a factor in creating backlogs, immediate steps should be taken to expedite the supply of the necessary parts; in the meantime, those maintenance operations which do not require parts or for which parts are available should be performed.

c. Production planning and control operations will vary from one maintenance unit to another, for no one system can satisfy the requirements of all types of maintenance shops operating under different conditions and supporting various types and quantities of ordnance materiel. Control problems in a shop which receives a variety of jobs and processes each job individually as soon as possible after receipt will, for example, differ considerably from problems in a shop which accumulates quantities of like items for processing by production line methods. However, the general procedures presented in this section can be used as a guide to develop a procedure to meet any requirement. (SB 9-48 also gives information on production control in ordnance maintenance shops.) Production control is the responsibility of the shop officer. If the production control operation is to be effective, it is imperative that the shop officer have a thorough knowledge of the mission and functioning of the entire unit. He must be thoroughly familiar with the capabilities and capacities of the individual sections.

PRODUCTION CONTROL BOARD
88th ORDNANCE GENERAL SUPPORT COMPANY

AWAITING INSPECT			AWAITING PARTS		AWAITING SHOP		IN PROGRESS										FINAL INSPECTION			
							SHOP						MACHINE SHOP		WELDING SHOP		PAINT SHOP		CANVAS & LEATHER	
AUTOMOTIVE							BAY #1	BAY #2	BAY #3	BAY #4	BAY #5	BAY #6	RECONDITIONING							
ARTILLERY							BAY #1	BAY #2	BAY #3	BAY #4	RECONDITIONING									
SMALL ARMS																				
INSTRUMENT																				
SERVICE																				

Figure 29. Production control board (sample).

2. Principal Tools of Production Control

Effective control demands prompt action based on information which is kept current and readily available. It requires a continuous flow of current data from all sections of the unit. Four of the most important tools of production control are:

a. *Production Control Board.*

- (1) The control board is a device used by the control office (shop office) to present visual, up-to-date information on the location of jobs within the shops and the load conditions of the various shop sections. It presents an accurate picture of the distribution of work within the maintenance shops and is extremely useful in promptly answering queries pertaining to specific jobs and in determining how work should be routed or rerouted due to conditions existing in the various shop sections.
- (2) The board is designed and constructed by the unit to satisfy the requirements of the unit. It is divided into sections for the various types of materiel maintained, with these sections being further subdivided to indicate the shop sections or operations which are involved in the maintenance process. The status of jobs, the progress of each item through the shop, and the load conditions of the various sections are indicated by the utilization of small tags, each representing a job order, which are moved from one section of the control board to another as the location of the job within the shop changes. The shop location of jobs reflected by the production control board should always coincide with the location noted in the tub file, and each of these tools acts as a check on the other to assure that both are kept up-to-date. A sample of a control board that might be used in an ordnance general support company is shown in figure 29. This sample may be used as a guide to design a specific board to meet any requirement.

- (3) The proper use of the control board tag enables the control office to quickly check the shop location of work. This tag varies in size according to the size of the board and the amount of information that is desired to be placed on the tag. Enough information should be included on the tag so that the job is readily identified. This information usually includes the job order number, designation of the requester, and the date received. Tags of different colors are usually used to represent priority: a RED tag to indicate critical or high priority jobs; YELLOW to designate jobs that are to proceed normally; and GREEN to identify jobs to be processed when the workload is light. When a quantity of like items is processed through a shop section in a continuous "run," the entire quantity may be covered by a single job order and represented on the control board by a single tag. Small arms repair jobs are often controlled in this manner. A general or depot maintenance shop whose mission is so specialized that quantities of like items are accumulated for processing by some type of production line method may use this type of control for major components or even for end items. Reasonable care should be taken to insure that all items included in any multiple-item job order are repairable without unusual in-process delays. If any item in the "run" is held up due to exceptional repair problems or parts shortages, it must be deleted and placed on a separate job order so that completion of the original order will not be delayed.

b. *Tub File.*

- (1) This file, like the control board, is constructed by the unit. Here again size and design are dictated by the requirements of the unit. It is used to house the Job Order Files, DA Forms 9-80, which contains all active job orders and the records pertinent to each. Tub files are divided into

TUB FILE

(G/S MAINTENANCE SHOP)

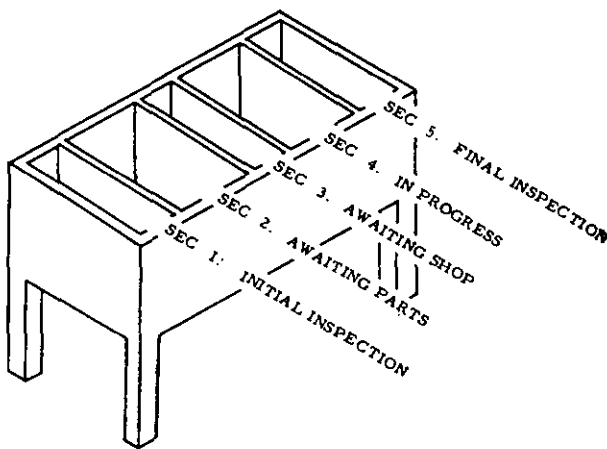


Figure 30. Tub file (sample).

sections and the job order files are moved from section to section as progress is made on a particular job. A representative type tub file is shown in figure 30. This type may be modified to meet any specific requirements.

- (2) The sample tub file is divided into five sections—

- (a) *Initial inspection.* This section is designed to hold job order files on jobs that are awaiting inspection or which are being inspected. The job order envelopes remain in this section until the control office receives the parts requests from the inspection section.
- (b) *Awaiting parts.* This section must be of sufficient size to accommodate all the job orders to be accomplished by the shops for which parts are not yet available. The files are moved to the next section when all parts have been received for the job or when the control office determines that enough parts are available to begin work on the job.
- (c) *Awaiting shop.* As a matter of convenience, this section may be divided into compartments, with job orders being moved up one com-

partment each day until they enter the shop. Although this separation is not essential, it is a rapid means of determining how long each job has been awaiting entry into the shop. The shop officer should, at all times, be kept informed as to the length of time jobs are awaiting shop. The tub file should be maintained in such a manner as to provide this information. (One method would be to tag each job order envelope with a notation as to the date parts became available, the date the job should enter the shop, and the date completion should be effected. Job orders in this section could then be checked daily to see if schedules are being met.)

- (d) *In-process.* This section is used to house all job orders on which work is being performed. It too can be compartmentalized, with job orders moving forward on a daily basis until they change status. Controls and daily checks, similar to those exercised while jobs were in an "awaiting shop" status, are necessary to assure that job orders are being completed on schedule and to focus attention on unanticipated delays so that corrective action may be taken.
- (e) *Final inspection.* This section is used to house the job orders on which work has been completed and which are awaiting pickup or final inspection.

c. Variable Repair Time Limits System. This is a managerial tool by which the actual workload, expressed in man-hours, can be balanced with the authorized maintenance level of a repair shop operation. The actual workload is the product of the number of jobs and the man-hours required to do each job. This system is based on the fact that a maintenance shop has a certain number of man-hours to expend on maintenance during a given period and that the workload of a unit should be limited to this capacity. This permits the pro-

TIME DATA																	
1 Job Order Number	2 Date Received	3 Item Description	4 Work Requested	5 Work Request Initiated By	6 Automotive			7 Armament			8 Service			9 Total Man-Hours	10 Final Inspection Completed	11 DISPOSITION	
					Date in Shop	Date Com. placed	Man-Hours	Date in Shop	Date Com. placed	Man-Hours	Date in Shop	Date Com. placed	Man-Hours				
A-10	4/1/59	Tank, Med. M48	Repair Turbine	19th D.S. Co				4/1/59	6/1/59	22					22	7/1/59	Cloud out for Evac.
G-42	4/1/59	Truck, 2 1/2 Ton M35	Replace Radiator Repair Front end and Drills	PP&H Ord Co Motor Pool	1/1/59	2/1/59	14				2/1/59	2/1/59	4	18	3/1/59	Complete	
A-11	2/1/59	Rifle, Cal. 30 M1 (50 aa.)	R. F. I.	100th APC Co				2/1/59	2/1/59	6				6	4/1/59	45 Complete 5 Evac.	
G-43	2/1/59	AV 1790 Engine	R. F. I.	Tech Supply	3/1/59	5/1/59	24							24	5/1/59	Complete	
NOTE: This form can readily be used in cases where separate registers are maintained for each principal repair shop.																	

Figure 31. Job order register (sample).

gramming of work consisting of a large number of small jobs, a few large jobs, or any combination thereof, and permits rapid determination as to whether the unit will be able to accomplish specific jobs or will have to evacuate them. *This system has only limited applicability at depot level.* The variable repair time limits system is explained in appendix VI.

d. *Job Order Register.*

- (1) The register is a multiple-purpose managerial tool which is used by the maintenance unit to record all work requests and job orders received; to indicate the types of equipment being worked on in each shop and the number of job orders assigned to each; and to identify the type repair operations required, the time consumed, and the disposition of the item. Since it identifies jobs by specific item identification and job number, it is useful in the preparation of reports, serves to assure that the other tools of control are being used properly, and serves as an index by which active or dead job order files can be speedily located, if necessary.
- (2) As with the other tools of control, the design and usage of the register may vary. All, however, should contain the essential information noted in (1) above. A suggested form for use in registering work requests and job orders is shown in figure 31. The columns on the form are self-explanatory.
- (3) The job order register is maintained by the control office. Local policy

may require all work requests and job orders to be entered on the same form, regardless of the type of repair required. In this case, the job order register will contain columns for each principal repair shop. (The number of shops represented on the form and their designations are not limited to those shown in column 6 of figure 31. The subdivision of this column depends on the needs of the individual unit.) It may be preferable, however, to sectionalize the register by job type, in which case the register would contain sections for each principal repair shop of the unit, and all jobs of one type would appear on one register, thereby further facilitating the location of information on particular jobs through isolation of the job by type. For instance, the job register could consist of an automotive or "G" register, an armament or "A" register, and a service or "S" register, if these were the principal repair shops of the unit. The form shown in figure 31 can be adapted readily to the needs of the unit by modifying the columns in each case.

- (4) The job order number should identify the shop responsible for accomplishing the major portion of the work. The final inspection column is not completed until the work performed by each of the repair sections involved is determined to be satisfactory.
- (5) Job order numbers are assigned to work requests in numerical sequence within each shop.

APPENDIX VI

VARIABLE REPAIR TIME LIMITS SYSTEM

1. General

a. The variable repair time limits system may be used as a guide to control the workload in a general support maintenance shop. It provides a means for determining the maximum workload the maintenance shops are capable of assuming and is used in determining which maintenance jobs will be performed by the unit and which will be evacuated to other maintenance activities.

b. This system replaces the "economical repair time limits system" which was used in the past. It is designed to maintain the maintenance workload at or near the rated capacity of the unit. The system, as described in succeeding paragraphs, cannot be applied in all respects until the unit has 10 to 12 jobs in its shops. Therefore, on the first day of operation in each new location, extreme care must be taken not to overload the shop with large jobs until a sufficient number of jobs is on hand to permit normal application of the system. Until this time, mandatory evacuation limits (par. 3a) should be established at 50 percent of normal. Moreover, the limits must be modified upon receipt of a movement order to permit phase-out of shop operations before movement.

c. Various factors which affect the capacity of maintenance units have been incorporated into the system. They include:

- (1) Productive personnel available.
- (2) State of training of individuals in the unit.
- (3) Number of jobs on hand.
- (4) Time required to complete each job.
- (5) Tactical or operational situation.
- (6) "Maintenance level" of the unit (par. 3c).

2. Principles of the System

a. Certain assumptions have been made in developing the system—

- (1) The actual workload is the sum of the man-hours required to complete all of the jobs on hand.
- (2) Jobs received by a shop over any given period will range from those requiring many man-hours to those requiring few man-hours.
- (3) Jobs will enter the shop throughout each day in a steady flow. The fact that each item must be inspected before being accepted or rejected will automatically space the jobs entering the shop.
- (4) The workload assumed by a shop in a given period should not exceed the number of man-hours available to do the work.
- (5) Unusual situations will have to be evaluated in the light of facts known at that time.

b. The system is based on the quantity of productive personnel available. For example, a maintenance shop which has 50 persons present for duty and is working a 10-hour day theoretically has 500 man-hours available daily. With a three-day workload (maintenance level) authorized the shop should have a workload approximating 1500 man-hours at all times. The programmed work should not exceed this figure. This permits the programming of work consisting of a large number of small jobs, a few large jobs, or any combination thereof. However, in determining the number of man-hours actually available the capabilities of individual workmen must be considered.

c. The inspectors estimate repair times based on the ability of fully trained repairmen. All personnel do not have the same productive capacity. Therefore, the unit commander, advised by his shop supervisory personnel, establishes for each repairman and helper an index

which indicates his level of skill. For example, in a shop with 50 productive personnel the commander might, for purposes of determining productive capability, divide his personnel into three categories: highly productive, average, and least productive. Numerical indexes of 1.0, 0.75, and 0.50 might be assigned to each category. The commander might then decide that 31 personnel of the shop fall into the first category, 10 in the second, and 9 in the third. The actual number of productive man-hours available per day could then be calculated as follows:

$$\begin{aligned} (1) & 31 \times 1.0 \times 10 \text{ (hours per day)} = 310 \\ (2) & 10 \times 0.75 \times 10 \text{ (hours per day)} = 75 \\ (3) & 9 \times 0.50 \times 10 \text{ (hours per day)} = 45 \\ & \text{---} \\ & 430 \end{aligned}$$

430, then, is the number of productive man-hours available per day, based on efficiency of personnel.

d. Similarly, the conditions under which the shop is operating will affect the time required to perform work. In addition, allowances must be made for times expended by personnel on administrative matters, drawing supplies, non-MOS duties, illness, etc. SR 310-30-15 gives a formula which makes allowances for these factors. This formula should be used in conjunction with the above calculations to obtain the number of actual productive man-hours available.

e. The system operates generally to retain the smaller jobs and evacuate the large ones. Except in the rare cases where many large jobs are accepted immediately after the opening of the shop, it will keep the shop working at or near capacity and will prevent overloading.

3. Controls

It is a principle of ordnance maintenance that all repairs will be performed at the lowest echelon practicable. The capacity of a unit is the limiting factor precluding full implementation of this principle. This system provides the means to make a determination of capacity. The principal controls of this system are—

a. *Mandatory Evacuation Time.* Regardless of the workload, there is a practical limit to the length of time each maintenance echelon can expend in the repair of any particular item.

When the time required to repair the item exceeds this limit, the item should be evacuated or salvaged. The “mandatory evacuation time” limit is expressed in man-hours. It can and should be used as an element of ordnance control to adjust and balance the workload among echelons consistent with the requirements of the tactical or operational situation.

b. *Mandatory Retention Time.* If a unit can repair an item in approximately the same time as it would take to process and evacuate it to the next higher maintenance unit, the item should not be evacuated. The time required to process and evacuate an item is the principal factor in establishing the “mandatory retention time.” This control limit is expressed in man-hours. All jobs requiring fewer man-hours than specified by this limit are retained and repaired by the lower echelon.

c. *Maintenance Level.* The workload authorized to be in any maintenance unit at any one time, expressed in days, is the “maintenance level.”

4. Establishing the Workload

The appropriate ordnance command (ordnance office, group, or battalion) is responsible for establishing the “maintenance level” for each maintenance unit in the command. The mandatory retention time will be determined by the particular situation in which the unit finds itself. Based on the maintenance level, each maintenance unit establishes the maximum workload for each major shop section by computing the number of productive man-hours available to the section per day and multiplying this figure by the maintenance level. The result is the maximum workload expressed in man-hours. In these computations, the unit may make any adjustments necessary to compensate for the state of training of the personnel of the unit.

5. Application

The following sample illustrates the ease with which the variable repair time limits system is used. Assume that the maintenance section, tank platoon, general support company has 50 productive people who are working a ten-hour day. The total man-hours theoretically available per day are 500. Computations

based on the maintenance level and the mandatory time limits as established by the appropriate ordnance command for vehicles are—

Maintenance level_____7 days.
Mandatory evacuation time__160 man-hours.
Mandatory retention time ____40 man-hours.

a. *Computing the Maximum Workload.* The total number of man-hours theoretically available per day (500) must be reduced to allow for divergence in the efficiency and training of personnel. The result of this computation (430 man-hours, see par. 2c) must be used in conjunction with the formula in SR 310-30-15 to determine the man-hours actually available. Based on SR 310-30-15, this computation is—

$$430 \times 75\% \times 75\% = 242 \text{ man-hours available each day}$$
$$242 \text{ mhhrs/day} \times 7 \text{ days (maintenance level)} = 1694 \text{ man-hours.}$$

The 1694 man-hours is thus established as the maximum workload which can be assumed by the section.

b. *Plotting the Workload* (fig. 32). The horizontal axis represents the number of jobs; the vertical axis represents the man-hours per job. The curve which is plotted is based on the formula—

$$\frac{\text{maximum workload}}{\text{number of jobs}} = \text{man-hours per job}$$

Utilizing the above formula the following points are plotted.

Number of Jobs	Man-hours per Job
8	211
10	169
14	121
16	106
20	85
30	56
40	42
50	34
60	28

c. *Using the Chart.* The completed chart provides a means of determining whether a job should be considered for retention or evacuation. As each job is received it is plotted on the chart. The known factors are the total

number of active jobs in the shop (taken from the production control board) and the estimate of the man-hours needed to complete repairs on the job being considered (taken from the inspection form). Using these two factors, a point is located on the chart. If the point falls below the plotted curve, the job should be retained; if it falls above the curve, the job should be evacuated. Normally, with a steady flow of jobs of varying sizes entering the shop, this initial determination will be adequate. However, before final disposition is made, the situation should be surveyed and any unusual conditions assessed. For example, if all the jobs in the shop are large ones, there may be a maintenance team available to work on a particular job, even though it falls above the curve. Caution should be exercised, however, not to obligate all maintenance personnel on large jobs, for in that case some of the smaller jobs may have to be evacuated. Emphasis should be placed on completing the smaller repair jobs and getting the equipment into supply channels as soon as possible. This will reduce the evacuation workload and free some of the personnel engaged in this function for other duties. The following examples illustrate how the variable repair time limits system is applied—

Example 1. The section has 14 jobs assigned. The inspector estimates that a new job entering the shop will require 95 man-hours. The job is not above the mandatory evacuation time, so the variable repair time limit curve is checked. This will be the 15th job, and since the time limit for 15 jobs is 113 hours, this job is within the limit and will be retained.

Example 2. The section has 30 jobs assigned. The inspector estimates that a new job entering the shop will require 115 man-hours. The job is under the mandatory evacuation time, so the variable repair time limit is checked. This will be the 31st job. On the curve, the 31st job time limit is 54.6 man-hours; therefore, the 115 man-hour job exceeds the variable time limit and will be evacuated.

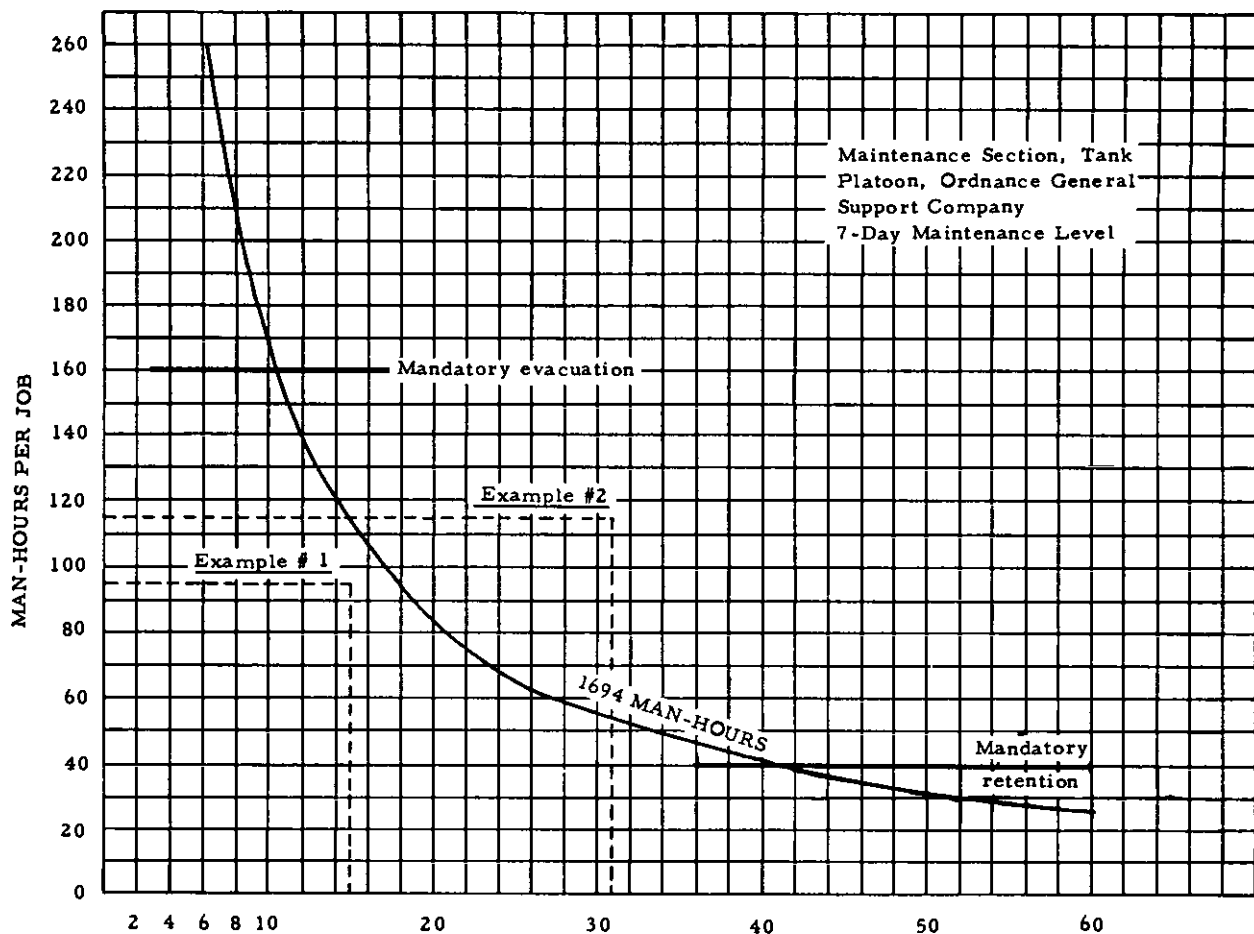


Figure 32. Variable repair time limits.

APPENDIX VII

PRODUCTION LINE OPERATIONS

Section I. THE PRODUCTION LINE PROCESS

1. Characteristics

a. Complex repair jobs can usually be performed most efficiently when they are broken down into a number of relatively simple tasks. Each task is assigned to a workman or team especially equipped and trained to perform the operation. This division of labor and worker specialization is practical only when it is possible to work continuously on the same type item for considerable periods. Workmen develop speed and dexterity through repetition of the same operations, attaining a high work output per man. In addition, personnel training problems are simplified, since workmen with little mechanical experience can learn to perform simple tasks in a minimum of time. Skilled technicians are utilized on the more intricate tasks and for supervision and inspection.

b. It is usually more convenient to move the item to be repaired past a series of work stations. This technique is usually referred to as the "production line" method of operation. However, many of the advantages of the production line method can be realized without the use of a moving line. Where the materiel to be repaired is heavy or bulky, it can be placed in a fixed location and the workmen perform their assigned tasks in the most logical order. Production line techniques are ideally suited to depot maintenance activities and can be profitably employed in many general support maintenance operations.

c. Efficiency in production line methods of operation requires careful planning of shop operations, personnel assignments, and supply actions.

2. Limitations

Fixed facilities are usually required for a maintenance operation organized on a produc-

tion line basis. If the threat of enemy action requires units and activities in the theater to maintain mobility for defensive purposes, production line operations may not be practicable. In addition, the sections of a production line installation cannot be dispersed to any appreciable degree without serious loss of productivity. Frequent movement of the installation will involve so much time for dismantling and reconstruction that savings effected through operating efficiencies will be canceled.

3. Repair Standards

Ordnance materiel may be repaired to a variety of standards. The standard established for each situation must be based on such factors as the requirement for materiel, availability of personnel and supplies, and the ability of the enemy to interfere with maintenance operations.

a. Materiel may be dismantled for detection and repair of all deficiencies. All parts, assemblies, and components which do not meet minimum serviceability standards are replaced, providing the operations involved can be performed without cutting or grinding the basic parts.

b. Repair operations may include resizing of basic parts, such as the reboring of engine cylinders to specified oversize dimensions. TOE tool and equipment sets do not include equipment for this type of operation, and the special tools must be obtained.

c. Materiel may be rebuilt to standards approximately equal to new condition. It is unlikely that the extensive facilities required for such operations could be installed or defended in a theater where modern weapons such as missiles and tactical nuclear devices are extensively employed.

d. Limitations on supplies, facilities, personnel, and time may restrict repairs to those

necessary to restore materiel to service. In this case, extensive dismantling is not undertaken.

4. Manning

Ordnance maintenance units are designed primarily for field type operations. It may be difficult to assemble the particular combination of skills and equipment required in a production line installation through employment of troop units. Tables of distribution and tables of equipment should be specifically designed whenever possible. Moreover, because of the limited training required, auxiliary labor can be used to advantage in such an operation.

5. Quality Control

Adherence to repair standards prescribed

for each production line shop depends largely on adequate inspection before, during, and after processing. Members of the inspection section examine materiel prior to repair to determine its condition and the work that must be performed on it. Qualified inspectors should be stationed throughout the shops to determine the serviceability of questionable parts and assemblies and to insure that repairs in process neither exceed nor fall below prescribed standards. Repair in excess of specified limits tends to cut production rates below necessary levels. Substandard repairs reduce the life expectancy of reconditioned materiel. Final inspections determine whether all deficiencies have been corrected and whether workmanship is satisfactory. All inspection activities are supervised by a chief inspector who is directly responsible to the installation commander.

Section II. FACILITIES

6. Basic Requirements

a. The establishment of suitable facilities for production line reconditioning of ordnance materiel depends, to a great extent, on the characteristics of the items to be reconditioned. For example, items which are both bulky and contain a multiplicity of parts require facilities that are more spacious and stable than those utilized by organizations performing field maintenance. In the latter case, much of the shop equipment can be mounted in vehicles, and many of the repairs can be performed in shop vans. Production line facilities, therefore, are usually established in ground installations, for vehicle-mounted equipment generally cannot provide the space and stability needed. The use of permanent type buildings is not an absolute requirement for efficient production line operations, but sufficient shelter must be provided to permit operations to be carried on regardless of weather conditions.

b. The economies inherent in this type of operation can be exploited almost as effectively in a relatively small installation as in a very large one. Many highly efficient production line shops have been operated by crews of less than company size in improvised structures equipped with locally fabricated fixtures. In modern warfare, where conditions prohibit

operation of a large establishment, it may be possible to accomplish a mission by dividing it between a number of small shops, all of which are similarly equipped.

c. In a temperate climate the basic facilities required for the smaller shops are relatively simple. Enough protected storage and work space must be provided to permit layout of all operations in efficient patterns and in proper relationship to each other. The various sections of a shop need not be housed under the same roof so long as convenient distances are maintained and traffic flow between sections is unimpeded. Shelters must be adequate to protect personnel and materiel from the elements under prevailing climatic conditions. They should be no more elaborate than necessary to serve this purpose since they are subject to loss through destruction or abandonment if a position becomes untenable.

d. Fixtures such as workbenches, engine cradles, and conveyor lines must be designed to prevent unnecessary handling and to facilitate movement of items from one work section to another. Rough fixtures, simply constructed, are preferable to elaborate fixtures, as long as they serve the purpose. All design and construction refinements which do not substantially increase efficiency should be avoided.

Wherever possible, buildings and fixtures should be designed so that they may be dismantled in transportable sections and reerected elsewhere in the event a location must be abandoned.

7. Shelters

a. Production line maintenance operations must be sheltered to the extent necessary for materiel protection and crew efficiency. Certain items, such as dismantled major components, require protection from dirt and weather. If existing shelters are not available, adequate facilities must be constructed.

b. In a favorable situation, standard engineer buildings may be erected. However, under conditions of modern warfare, many depot maintenance activities may have to operate in temporary shelters. Building activities should not be undertaken until it has been determined that no suitable tentage is available. If adequate tentage cannot be obtained, temporary shelters may be built from materials normally available in the theater. Unless wind or snow loads are excessive, frames of light timbers or poles roofed and sided with tarpaulins will suffice. Roofs should be reinforced with hardware cloth or other sturdy screening material. Side tarpaulins should be applied in such a manner that they can be rolled up in good weather for light and ventilation. Air-strip landing mat, planking, packed gravel, or other suitable material will serve as flooring.

c. Electricity for light and power must be provided by portable generators if no central plant is available.

d. In cold weather, the heating of facilities may present a serious problem. Flimsy structures dissipate heat rapidly. Stoves, possibly built from drums, may be the only heat source available. Such heaters are hazardous and should be used only if there is no alternative. High output devices such as aircraft engine heaters are usable, if available. Whatever the method used, temperatures will probably be no more than tolerable, unless a steam plant can be obtained or constructed. The latter is the most satisfactory and least dangerous of all methods in such applications.

8. Fixtures

Shop-made fixtures required for the various repair operations must be carefully designed and built. They will probably be made of wood, since this is usually the most readily available material. These fixtures must be sturdy to stand up under the hard and continuous use to which they are subjected. They must also be portable in order that they may be transported if the installation must be dismantled and reerected elsewhere. Too much valuable time and material is invested to permit abandoning them unnecessarily. Most of the fixtures mentioned below require two-inch lumber. Bolts or screws should be used as fasteners wherever possible.

a. Workbenches must be solid, well braced, and no larger than necessary. Few benches need be wider than two feet; eighteen inches is sufficient for most.

b. Pallets are designed for each specific job. Size is held to a minimum. Since they must hold the heaviest items, such as power train components, two-inch lumber is required. Bolted construction is desirable.

c. Parts bins must be so designed that partitions may be readily inserted and removed. One-inch lumber is sufficient for storage of most parts. Since these items are bulky, unnecessary strength and weight is undesirable.

d. Trestles for conveyor lines must be designed in sections in order that they may be dismantled for movement. Individual sections must be heavily braced and should be as small as practicable to facilitate movement.

9. Cleaning

Manual cleaning of bulky, heavily soiled components is a very time consuming operation which can create a serious bottleneck in production line operations unless unskilled local labor, employable only for rough work, is available in quantity. Cleaning equipment capable of quickly removing grease, heavy soil, and corrosion is most desirable.

a. *Cleaning Process.* A series of dipping tanks should be provided to facilitate the cleaning of materiel (fig. 33). These may be built in the shop if the necessary steel, pipes, and

heating facilities are available. These tanks will contain in order: a grease and paint removing solvent such as compound, alkali type (P-R-191, class 1); a hot water wash; a solvent such as conditioner and rust remover, phosphoric acid base (MIL-M-10578); a hot water wash; and a preserving bath such as lubricating oil, preservative, special (MIL-L-644).

Note. This process must not be used for cleaning bearing shells, pot metal items, aluminum items, zinc items, nonmetallic items or sealed assemblies, as they will be damaged by the chemicals. In addition, this type of cleaning is unsuitable for anti-friction bearings since it is hard to dry them quickly enough to prevent rusting. Cleaning certain small parts such as wheel brake cylinders in the large tanks is a waste of time.

b. Tank Construction. Tanks must be designed to accommodate the largest items which will be cleaned therein. Construction material must be heavy—at least 1/8-inch black iron—to sustain the weight of the liquids and loaded baskets. Two-inch angle iron should be welded to the outside on all corners and around the top and bottom, leaving all inside surfaces clear. All tanks must be fitted with drain valves, preferably at least two inches in diameter. If steam coils are used for heating, they must be mounted approximately six inches from the tank bottoms to form a mud sump. Coil supports must be heavy enough to carry the weight of a loaded basket. The acid tank must be replaced periodically unless it is lined with sheet lead. Tank footings may be of firm clay, gravel, or concrete.

c. Basket Construction. Baskets must be large and sturdy enough to accommodate the largest, heaviest loads they must carry. Half-size baskets for dipping smaller parts may be immersed two at a time, thus speeding up the operation. Basket frames should be constructed of angle iron. Bottom strips may be of angle or strap iron. Angle iron skids should be welded across bottom frame members. Lining with one-quarter inch hardware cloth will prevent loss of small parts. Handles must be long enough to meet well above liquid levels when baskets are fully immersed. This feature permits ready removal of the hoist hook for use on other baskets waiting to be moved.

d. Basket Handling. A simple monorail provides the most efficient basket-handling method. Heavy timber or steel posts set deeply enough into the ground or floor to be self-supporting will serve as end supports. A steel I-beam fitted with a simple dolly is mounted directly over the center line of the tanks. This beam should extend far enough beyond end support cross members to enable baskets to clear the tanks at both ends. Stops must be provided at both ends of the beam. A chain hoist is used to raise and lower baskets.

e. Sidewalk Construction. Sidewalks should be high enough to allow about four feet from walk surface to tank top. This clearance places workmen in advantageous working positions and minimizes danger of injury from splash. Walk width should be at least three

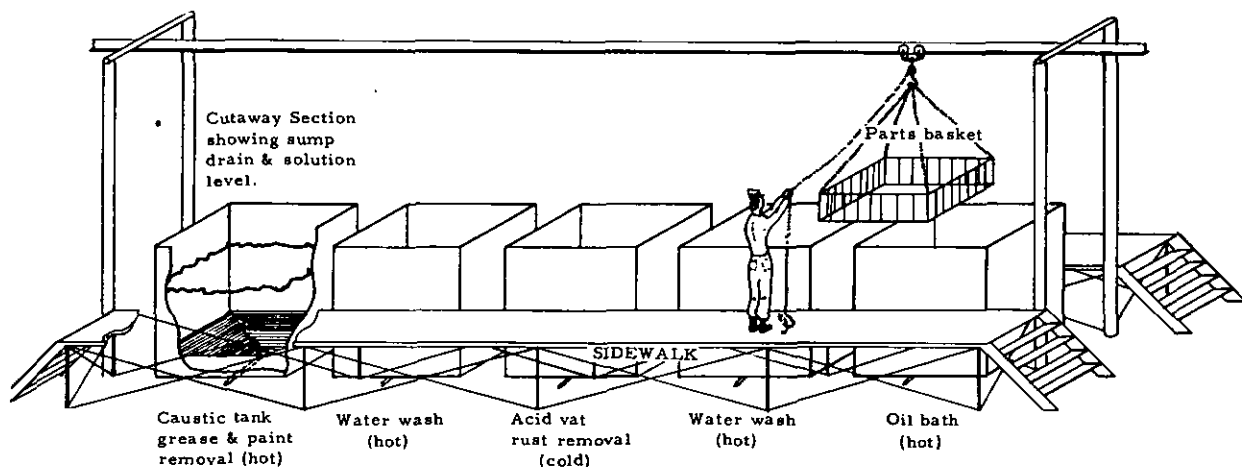


Figure 33. Central degreasing and paint removal system.

and one-half feet. A rail on the outer edge of each walk is a desirable safety feature.

10. Packaging and Preserving

Inasmuch as materiel repaired in a depot maintenance installation is released to depot stocks, it must be properly preserved and packaged after repair. Items will be preserved to the extent necessary to protect them from damage and deterioration in the circumstances under which they will be handled and stored. Certain components have openings which must

be sealed tightly to protect machined surfaces from dirt and moisture. Exposed shafts and other protruding elements must be protected against bending or burring. Many items require crating or packaging. Reusable boxes should be used if available. If available quantities are not sufficient, additional crates must be obtained from outside facilities or manufactured in the maintenance installation. If large scale crate production is necessary, power equipment must be obtained. Preservation and packaging instructions will be found in TM 9-1005 and SB 9-156.

Section III. SHOP LAYOUT AND OPERATION

11. General

This section depicts a type of production line shop which can be operated in improvised shelters using simple, locally fabricated fixtures. The principles of the production line method, illustrated by the wheel vehicle operations described in the following paragraphs, may be applied in the reconditioning of most ordnance items which are complex enough and used in sufficient quantities to warrant production line processing. The sample layouts and procedures prescribed in this section are designed to provide general guidance in the application of those principles and may be varied to suit specific situations. Information available in technical manuals pertinent to the various items of ordnance materiel must be used to supplement the general guidelines presented in this section. The production lines described in the following paragraphs, in common with most operations of this type, can be more effectively manned and equipped by means of tables of distribution and allowances than by employment of troop units using TOE equipment.

12. Engine Recanditioning

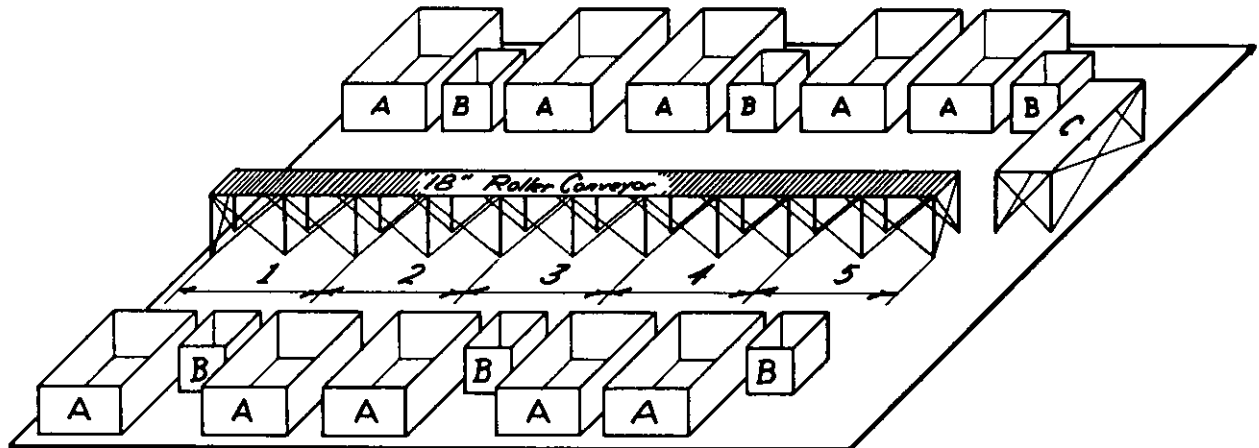
The facilities required for the disassembly of the automotive engine, repair of its many components and accessories, and reassembly into a complete item are the most complex, most carefully coordinated of all the facilities used in a production line automotive shop.

a. Figure 34 illustrates an engine disassembly line suitable for complete dismantling of

the item. On arrival at the line, each engine is drained of oil and placed in a holding fixture or pallet. When engines are received at the line with transmissions attached, the transmissions are removed at the first station and sent to transmission disassembly. All parts and accessories should be placed in cleaning baskets immediately on removal to minimize handling. Parts are cleaned and delivered to the appropriate reconditioning facilities in the baskets in which originally placed. Unless cylinders are to be rebored and all bearing surfaces reconditioned, all internal parts removed from the engine block must be tagged, since they must be reassembled into the same engine. Cleaning may be accomplished at the central cleaning facility or may be done by hand in the solvent vats. If the shop operates on a repair-as-required basis, complete disassembly may be reserved for those engines having a large number of defects. Others may bypass certain stations in the line. This determination is made by the inspector. If defects are few and obvious, an engine may be removed from the line for repair in a job shop. Such a shop is shown in figure 35.

b. Parts and accessories are delivered to the reconditioning line (fig. 35). Engine blocks are placed on pallets on conveyor lines shown at the bottom of the diagram. Two lines are provided in order that blocks having many defects may be sidetracked while those requiring little repair proceed through the other line. Due to the difficulty of turning engine blocks on the conveyors without jarring the entire

- A - Pallets or cleaning baskets to receive used components
 B - Small baskets or containers to receive bolts, nuts, washers, valves, etc.
 C - Bench for disassembly of cylinder head



1. Remove all accessories
2. Remove clutch, flywheel and housing, manifolds, and rocker arms
3. Remove water pump, cylinder head, side pan, push rods, and timing cover
4. Remove oil pan, oil pump, pistons, and rods
5. Remove camshaft, followers, crankshaft, and main oil gallery plug

Figure 34. Engine teardown line.

line, blocks are removed manually to workbenches beside the line for inspection and repair. They are then returned to the conveyors. Other parts and accessories are delivered to racks adjacent to the workbenches shown in the center of the diagram. These racks are divided into two main sections. One section is reserved for items awaiting inspection and repair; the other contains sufficient bins to hold required repair parts and space to receive items after repair. Repair parts stocks include such items as extra pistons, rods, etc., to replace those found to be irreparable. Items which are combined into sets for installation in the engine are released from the repair bench in complete sets. Workbenches are equipped with vises and other suitable holding fixtures. Inspection and repair procedures for all items handled in this shop are covered in appropriate technical manuals.

c. Engine assembly lines appear at the top of figure 35, and a blowup of a single line is shown in figure 36. At least two lines should be provided so that blocks arriving at the line before their internal parts are ready may be sidetracked, while blocks for which mated parts are available proceed on the other line.

Racks are placed beside the first 15 feet of the lines to receive internal parts which will be tagged for specific blocks. Bins placed along other portions of the lines receive the interchangeable components and assemblies from the repair lines. These bins also contain the additional quantities required to replace those found to be irreparable and the small parts required for engine assembly. Sixteen mechanics and one supervisor are required to operate the line. With proper supply support this line should produce 16 completed engines per 8-hour shift. Approximately twice this production can be expected if stations 1 and 4 are duplicated and if three swing men (repairmen who help out when needed) are provided in addition to the four men required to operate the new stations. The engine block is placed on a pallet or sheet of plywood at station 1. At station 6 it is placed pan down in a holding fixture in which it completes the trip through the line. These fixtures should be made long enough at the rear end to support a transmission if it is a common practice in the shop to assemble engines with transmissions.

d. Shop supply personnel are responsible for stocking all parts bins in the engine shop with

ENGINE PRODUCTION LINE

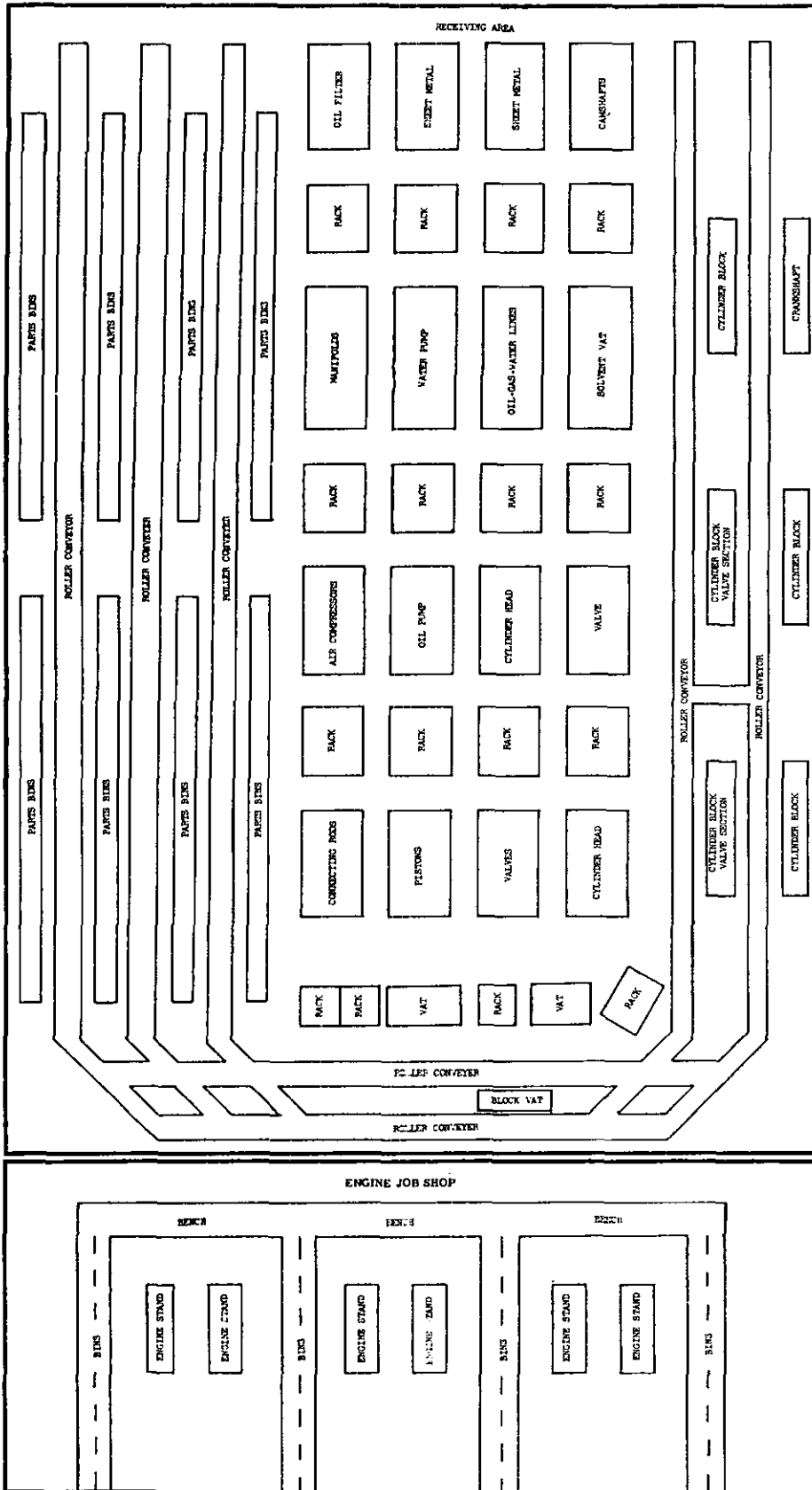


Figure 35. Engine job shop and production line.

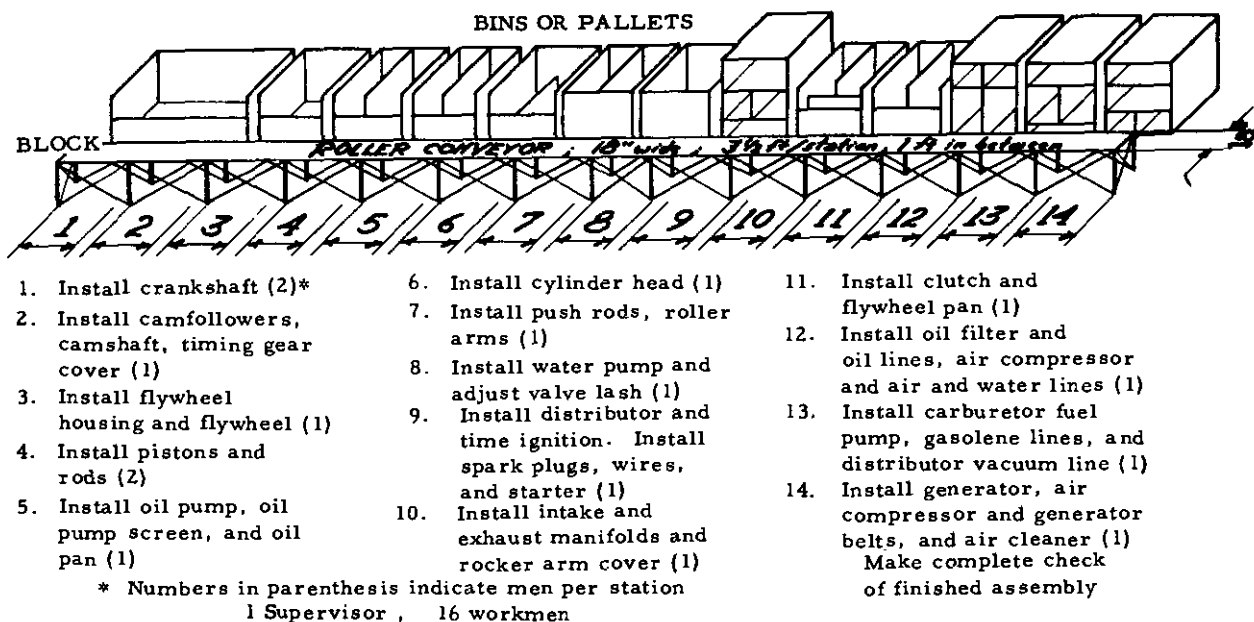


Figure 36. Engine assembly line.

predetermined quantities of repair parts and assemblies. They should also transfer repaired items from the repair stations to assembly lines or to stock, whichever is applicable. Finished engines are also transferred to stock, or to an end item assembly line if end items are reconditioned in the installation. The supply activity must perform these operations in order that accurate records may be kept of parts expenditures and losses of components through irreparability. These data are vital to computation of future supply requirements.

13. Fuel and Electrical Shop

a. Figure 37 shows a type layout for the repair of fuel and electrical assemblies. Testing and painting equipment are not shown. Standard van-mounted test equipment is ideal for this operation and should be used if available. Painting, however, is usually done in a somewhat remote area because of the fire hazards involved.

b. Unserviceable assemblies are received in bins and racks provided near each workbench. These assemblies are repaired by the workmen using parts from the repair parts bins, after which they are placed in "repaired" bins or racks.

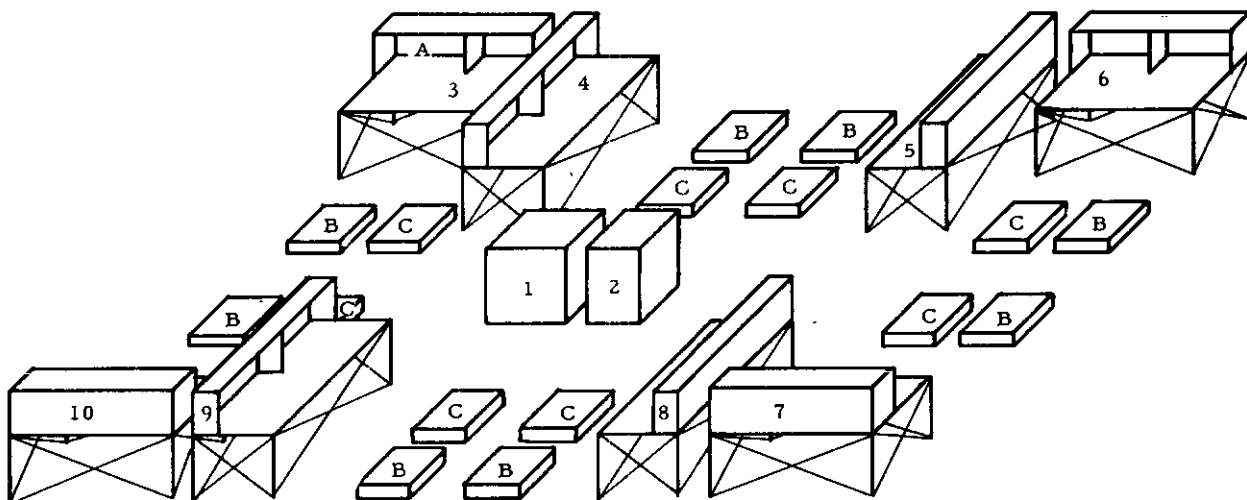
c. From these bins or racks, repaired assemblies are routed to the test bench. Carburetors

are given operational tests and adjusted as necessary. Assemblies requiring painting are routed to the paint shop after testing. They are then sent to assembly lines or to stock.

14. Transmission and Transfer Case Reconditioning

a. Due to similarities in construction, transmissions and transfer cases may be reconditioned in the same shop. These units are not well suited for reconditioning on a moving line. Figure 38 illustrates a suitable bench type layout. Production line economies are effected, in this instance, by placing several units on the benches and moving specialized workmen from one unit to another.

b. In a repair-as-required shop, a journeyman mechanic removes each cover or top, after which the inspector and the journeyman determine the extent to which units must be repaired. A helper then disassembles each unit to the extent decided upon and cleans the parts removed, or sends them to the central cleaning facility. The journeyman then reassembles the dismantled units, replacing unserviceable parts with serviceable replacements. The helper assists in the reassembly as his time permits. This arrangement limits the operations which must be performed by one man and makes the most efficient use of the time of both men. A



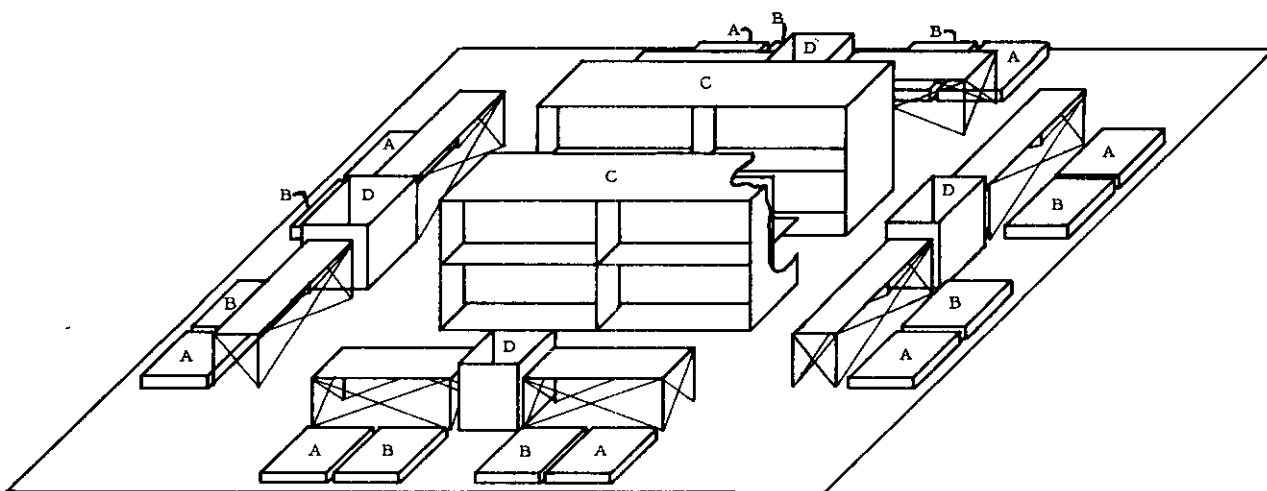
- A Repair parts bins
- B Unserviceable assembly pallets
- C Serviceable assembly pallets

Note: No test equipment shown.
Testing and painting done
in other areas.

Crew: 16 specialists (2 per sta)
4 helpers
1 supervisor
1 inspector

- 1. Carburetor cleaner
- 2. Solvent cleaning vat
- 3. Wiring & misc
- 4. Carburetor
- 5. Fuel pumps & filters
- 6. Generator
- 7. Instruments
- 8. Regulator
- 9. Distributor & magneto
- 10. Starter

Figure 37. Fuel and electrical shop.



- A - Serviceable assembly pallets
- B - Unserviceable assembly pallets
- C - Serviceable spare parts bins
- D - Solvent cleaning vats

Figure 38. Transmission and transfer case shop.

holding fixture should be provided for each type unit processed in order that manual handling and turning may be held to a minimum. Repaired items placed on pallets are removed by shop supply personnel. Parts bins are conveniently located to minimize time spent by workmen in obtaining parts for each job. As in all other sections of the installation, shop supply personnel stock the bins and record expenditures.

15. Axle Reconditioning

Axle disassembly and reassembly can be accomplished efficiently on lines consisting of several stations. Handling facilities consist of steel or timber rails along which axles are pushed from one station to another. Lines will accommodate front, rear, and intermediate axles.

a. Each of the three stations on the disassembly line (fig. 39) requires two men. At station 1, one man removes the axle shafts while the other removes the bolts from the center section or "third member." Together, the two workmen remove the third member with the aid of a hoist or a bar and fixture. The axle is then pushed to station 2, where right and left brake drums and wheel bearings

are removed. Brake parts are removed at station 3 and the stripped axle is pushed off the rails at the end of the line. All axle parts are placed in boxes or cleaning baskets as they are removed. Wheel bearings, wheel brake cylinders, and third members are cleaned in the solvent vat in the nearby axle assembly area. All other parts, including the stripped housing, are sent to the central cleaning facility. In a repair-as-required shop, an axle assembly requiring few repairs may be removed from the disassembly line after inspection and placed in the axle job shop provided for accomplishment of limited repairs.

b. The axle repair and assembly shop pictured in figure 40 includes facilities for inspection and repair of third members. After cleaning, these members are delivered to the "unserviceable" rack in the assembly area. The repairmen places members from the rack in suitable holding fixtures for complete disassembly. Parts are inspected individually and replaced as required. Ring and pinion gear sets from each axle are kept together, since they have become a matched set through use. If one of these gears is unserviceable, both must be replaced. After reassembly, third members are placed in the ready rack at the

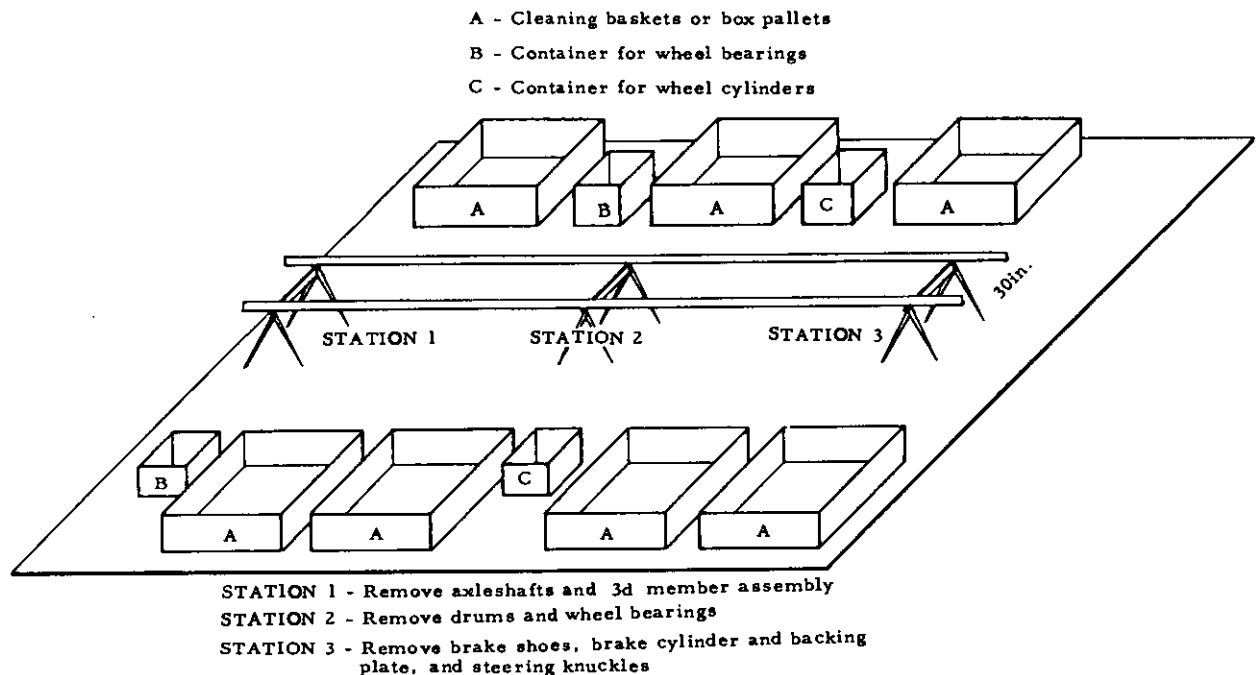


Figure 39. Axle disassembly area.

head of the assembly line. Meanwhile, other parts are delivered from various shop sections. Housings are returned from the cleaning section and stored in the ready rack at the head of the line. Brake parts are delivered from the brake and clutch shop and placed in parts bins adjacent to the line. These bins contain stocks of small parts required for assembly. Components for replacement of those found irreparable during inspection are also stocked here. A swinging boom equipped with dolly and chain hoist places axle housings on the assembly rails. Third members are placed in housings with the aid of the boom. Axles are then pushed from station to station until assembly is complete. It will be noted that different operations are performed on front and rear axles at several stations. This circumstance does not preclude running front and rear axles intermixed. When assembly is completed, the repaired axles are painted and released to stock or to an end item assembly line if such a line is operated in the installation.

16. Brake and Clutch Shop

It is convenient to locate brake and clutch parts reconditioning operations in the same shop. The benches, bins, and relatively small

machinery required for these operations may be placed together in a compact arrangement. Moving lines are unnecessary for these operations. Production line techniques may be applied by specializing certain workmen in disassembly while others perform repair or reassembly operations. All of the parts are small enough to be passed from hand to hand. Figure 41 depicts a shop of this nature. Power brake cylinders may also be repaired in this shop. Details of disassembly, repair, and reassembly will be found in appropriate technical manuals.

17. Body Shop

The body shop in a production line maintenance activity usually includes the sections shown in figure 42.

a. Welding Shop. The welding shop takes care of all welding done in the entire reconditioning facility. The welding foreman may furnish men and equipment on a loan basis to any section where welding or heating services are needed. In addition to taking care of all odd welding and heating jobs in the facility, the welding shop is responsible for all welding, heating, bending, and fabrication of jigs, fixtures, and parts required in the installation.

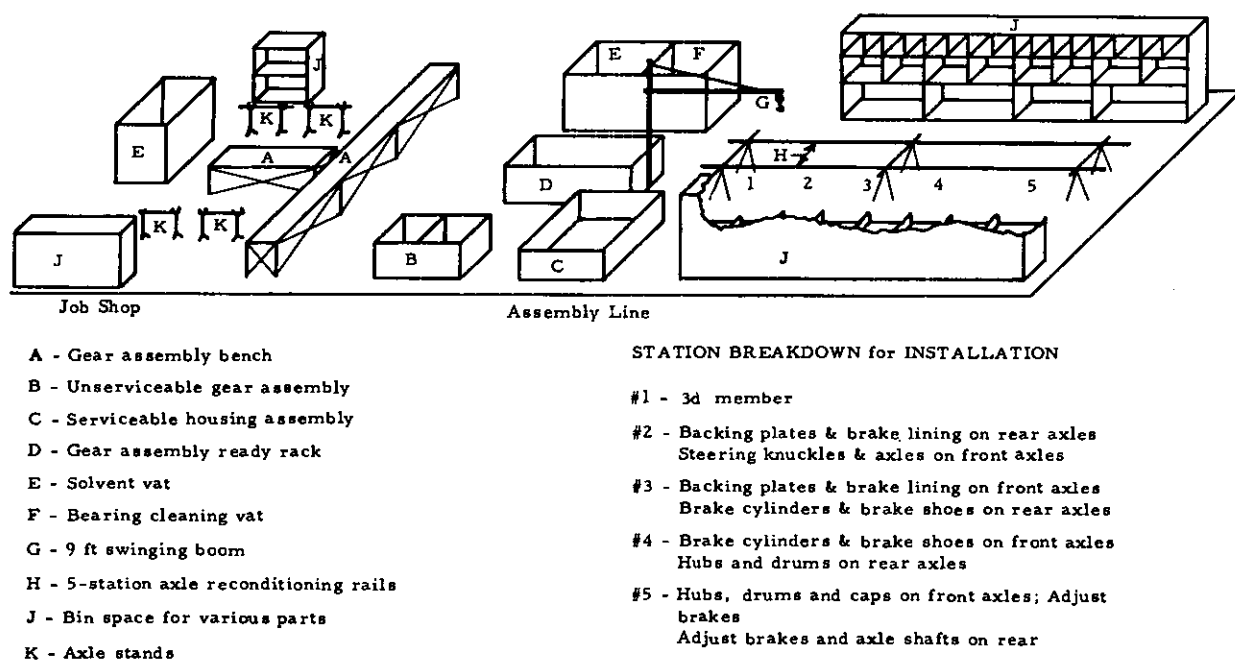
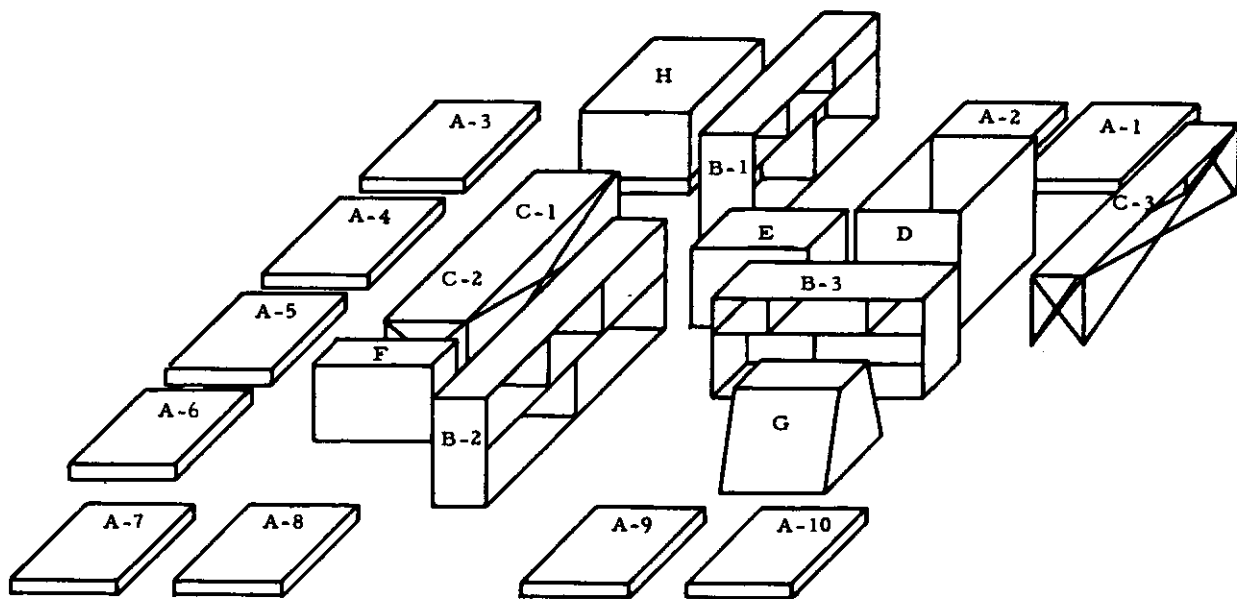


Figure 40. Axle assembly section.



A - Pallets

1. Serviceable hydraulic cylinders
2. Unserviceable hydraulic cylinders
3. Serviceable clutch covers
4. Unserviceable clutch covers
5. Serviceable clutch plates
6. Unserviceable clutch plates
7. Serviceable brake shoes
8. Unserviceable brake shoes
9. Unserviceable brake drums
10. Serviceable brake drums

B - Bins

1. Clutch cover parts
2. Clutchplate parts, rivets, brake linings, wheel studs
3. Hydraulic cylinder parts

C - Workbenches

1. Clutch station
2. Brake station
3. Hydraulic cylinder

D - Cleaning vat

E - Honing machine

F - Rivet machine

G - Brake drum lathe

H - Clutch cover machine

Figure 41. Clutch, brake, hydraulic cylinder, and drum section.

Radiator repair and oil cooler repair are generally under the jurisdiction of the welding supervisor. For these operations he usually has radiator repairmen assigned to his shop.

b. Carpenter Shop. Woodworking machinery is located in a central section of the carpenter shop. The main function of the woodworking shop is to repair wooden portions of ordnance equipment. However, the shop may be called upon to fabricate special pallets and boxes to be used in and around the depot shops. Normally, the equipment oper-

ators will be kept busy turning out wood panels, sections, bows, seats, etc., to specifications while the installers will perform their installation functions somewhere quite removed from the wood shops, such as in the job shop, on the body line, or in the production line area.

c. Cargo and Dump Body Section. The repair of cargo bodies requires the use of heavy tools and equipment. As a rule, the use of heat will be required in many places and, in some cases, whole sections will have to be cut

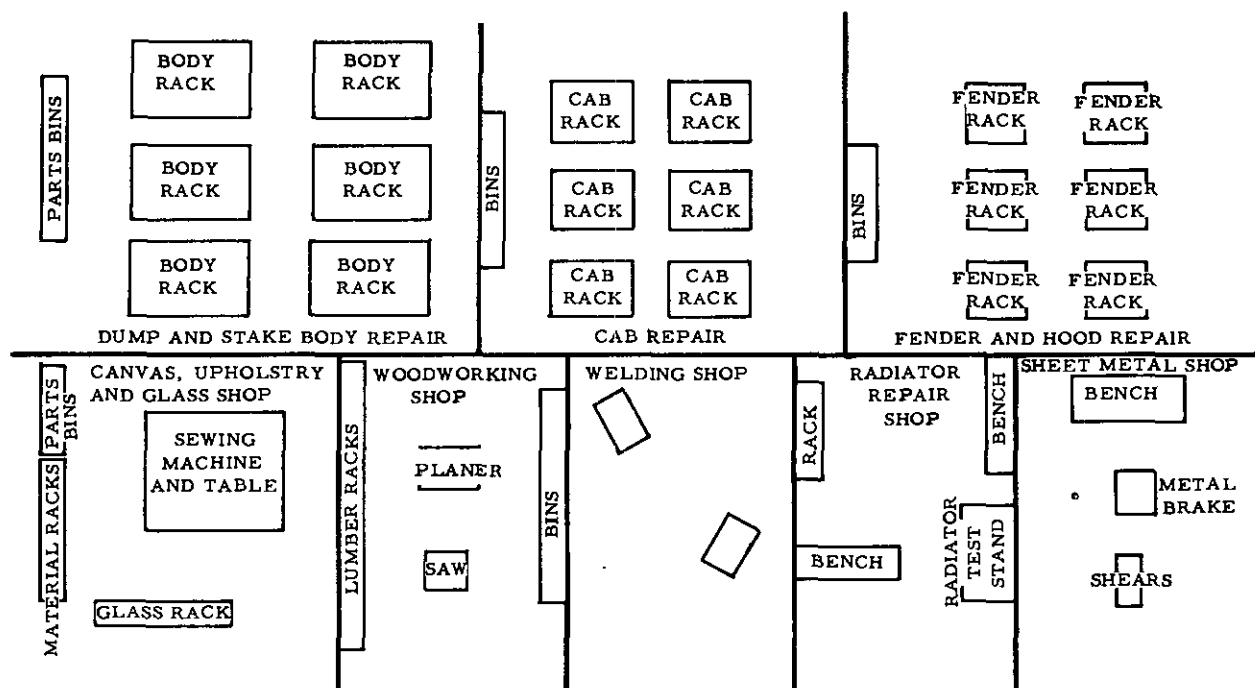


Figure 42. Body shop.

out and replaced with newly fabricated material. Stands that will hold the body in the most advantageous position should be used if possible. When repair is complete, the body should go directly to the paint booth for priming and application of the first coat of paint so that the danger of rust may be eliminated.

d. *Cab Section.* Cabs are usually repaired on stands of sturdy construction just high enough off the floor to make them easy to work on and to give easier access to all parts. The cab will be completely reconditioned in the cab section so that when it leaves the line it is a complete unit, including doors, catches, fittings, door glass, windshield wipers, dash instruments, and wiring. The personnel needed for wiring and dash instrument repairs are furnished by the fuel and ignition section. They receive specific work assignments from the cab section supervisor. The completed cab assembly goes directly to the paint shop for a coat of primer and a first coat of paint when it leaves the shop.

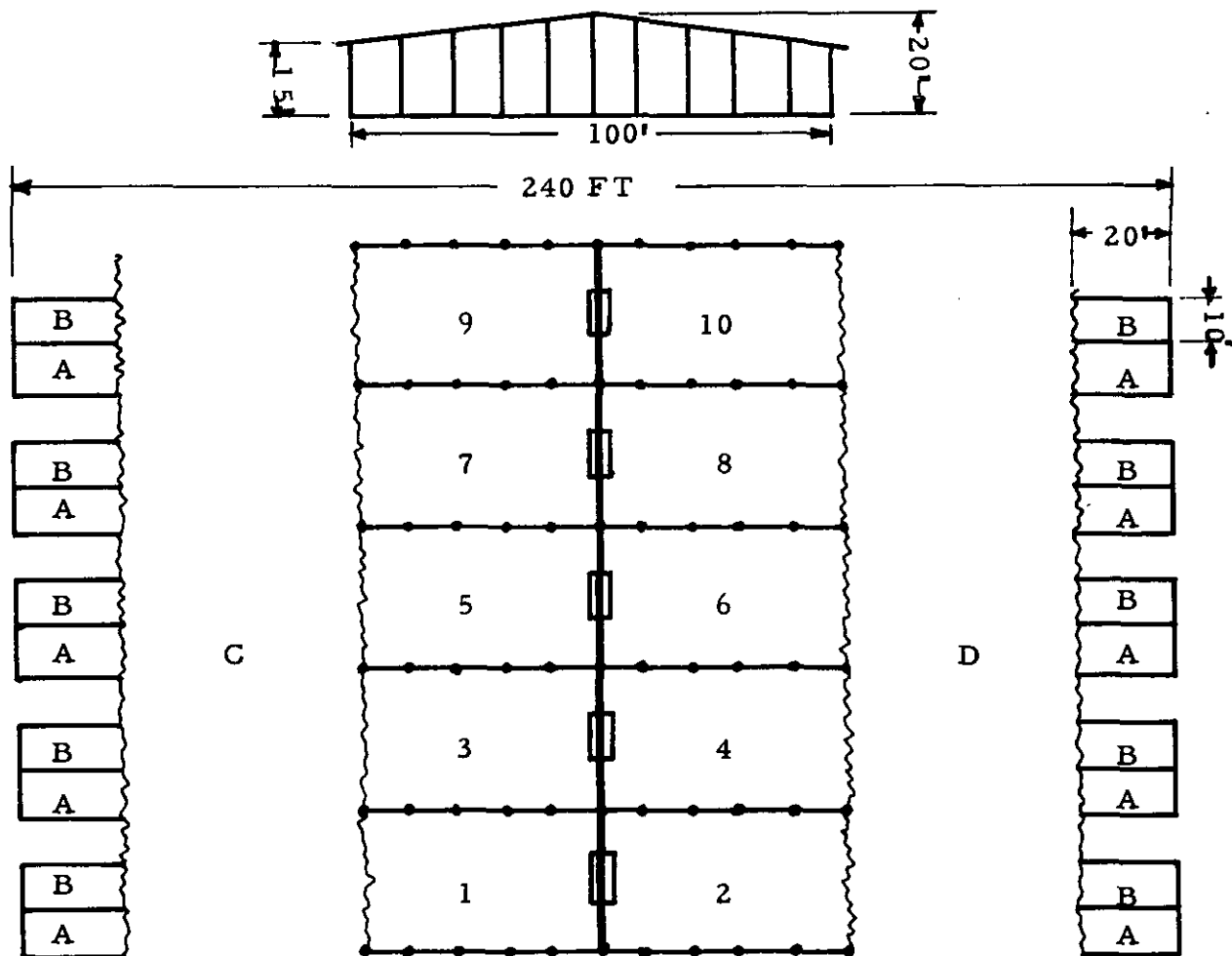
e. *Fenders and Hood Section.* Fenders and hoods are repaired on suitable stands which are high enough to make all parts accessible and constructed so as to facilitate ready re-

positioning of the items on the stands. After the hood or fender is roughed out, it is put on a stand which incorporates a jig to insure that the completed job will retain its original, standard shape. This precaution assures the installer that all bolt holes, etc., on the truck and fender or hood will match at the time of installation.

18. Steering Gear and Driveshaft Section

a. Steering gears are disassembled completely and cleaned in a small vat in the bay or in the central cleaning area. After cleaning, the parts are inspected and the steering gears are reassembled, adjusted, and checked for proper operation. They are then sent to the paint shop and, finally, to supply or the reconditioning line.

b. Propeller shafts are sometimes reconditioned in this section. In such cases, shafts are sent to central cleaning before disassembly and come to the work bay clean. Here they are disassembled and checked for worn splines, kinks, bends, or other damage. New trunnion bearings and seals are installed and the shafts are sent to the paint shop and then to storage or to the end item line. Suitable holding



1 through 10 - Bay type shop with workbench at inner end
 Bay size - 50 feet long, 30 feet wide

A - Open Storage - Stockpile of serviceable palletized assemblies,
 10 feet between each pair

B - Open Storage - Stockpile of unserviceable palletized assemblies,
 10 feet by 20 feet

C and D - 50-foot driveways

Figure 43. End item shop.

fixtures should be fabricated to speed up drive-shaft work and prevent damage to the drive-shaft "ears" during disassembly and re-assembly.

19. End Item Reconditioning

Addition of a shop facility of the type depicted in figure 43 is all that is required to give the above described installation an end item reconditioning capability. Sheds may be built over the storage pallets on either side of

the central shed if desired. No component disassembly is performed in this facility. Unserviceable components are replaced with units reconditioned on the installation's assembly lines. Unserviceable components thus replaced are turned in to shop supply for reconditioning. If the installation operates under a repair-as-required policy, simple repairs which do not require removal of faulty components from end items will be made in the bays.

Section IV. SHOP SUPPLY

20. General

The orderly discharge of completed items from the end of a production line is dependent on the uninterrupted timely flow of parts and supplies to all stations on the line. An empty bin has the same effect as a vacant station—the line halts. When work on an item in a repair-as-received shop must stop for lack of parts, the crew on that job is assigned to another job for which parts are available, and overall productivity of the shop is not seriously affected. There are no alternate jobs to which an idled production line crew may be assigned. A work stoppage due to a supply failure inactivates a sizeable portion of the shop's production capacity until supplies are obtained or the line is set up for a new job. Frequent or prolonged stoppages of this nature can cancel out the advantages of production line operation. Therefore, every possible precaution must be taken to avoid supply deficiencies. Certain refinements must be added to the basic supply procedures prescribed in regulations to satisfy the special requirements of a production line activity. General principles discussed in the following paragraphs should be applied to the design of the shop supply system for any production line shop.

21. Computing Requirements

Production runs must be planned far enough in advance to allow for computing, requisitioning, and receiving the necessary supplies. A line is not ordinarily set up for a run until all the supplies needed to complete it have been received, checked, and stored by shop supply and are ready for movement to the line. Methods used to compute supply requirements depend, primarily, on the repair standards under which the shop operates. There are many possible variations on the standards described in paragraph 3. Two general classes and the supply computation techniques appropriate to each are discussed in *a*, *b*, and *c* below. Regardless of the methods used, the allowable margin for error is small. Minor shortages will result in an incomplete run. A major oversight, such as failure to procure a single part which is required for a high per-

centage of the items in the run, will halt the entire job.

a. In a shop where items being repaired are completely dismantled for replacement of all parts subject to wear or deterioration, supply determination presents no problem. Requirements are computed by multiplying the quantity of each part requiring replacement in each assembly to be repaired by the total number of assemblies in the run. Error in computation is the chief hazard here.

b. When the need for parts replacement is determined by inspection on the line, the supply problem becomes more complex. If a fairly large number of like items are to be repaired, parts requirements may be estimated by inspecting a percentage of the total quantity. When this method is used, care must be exercised to assure that the sampling is representative of the whole. Any valid random sampling technique may be employed to select the items to be inspected. The probability of error decreases as the total number of items in the run and the percentage inspected increases. If the same type of item has been previously repaired in the shop, experience gained in the earlier runs can be used to determine requirements.

c. In a shop which processes a considerable variety of items in relatively short runs, it may be impractical to order parts for each job. This situation is most likely to occur when a number of small shops operate under a central control agency, and job scheduling is determined by the urgency of the need for specific types of items rather than reparable quantities accumulated. Under these circumstances, it may be necessary to maintain representative stocks of parts required to repair the types of items for which each shop is responsible. If recurrence of runs on various types is consistent enough, it may be possible to use only the stock leveling procedures described in AR 711-16 to establish appropriate stock levels. In every case, however, the additional expedients described in paragraph 22 below, should be considered.

22. Records

In addition to the conventional stock records

ASSEMBLY

PART	RUN NO-- (--ASSYS) QTY	AVERAGE PER --	RUN NO-- (--ASSYS) QTY	AVERAGE PER --	RUN NO -- (--ASSYS) QTY	AVERAGE PER --

NOTE: Averages should be computed on completion of each run.

Figure 44. Supply expenditure data sheet.

prescribed in AR 711-16, certain auxiliary records are desirable in a production line shop. Supply expenditure experience gained in each production run should be preserved for future use. A card of the type illustrated in figure 44 offers a convenient means of recording such data. It may also be desirable to devise an extra insert to the standard stock record card to indicate the items in which the part is used and the average expenditure per quantity repaired. (12 per 100, etc.) Many such expedients are possible. Their effectiveness depends on the ingenuity of the supervisors who design them and the care expended by the personnel who maintain them.

23. Supply Operations

The shop supply crew which serves the lines is as much a part of the production operation as the mechanics at the stations. Supply service in the shop must be planned to satisfy the peculiar requirements of each type operation when the shop layout is originally created. Adjustments must be made as experience indicates, and when the shop plan is altered. The principles of division of labor to simplify individual tasks and reduce waste motion apply to the relationships between mechanical functions on the line and the supply functions which support them. Distances which mechanics must move to pick up reparable assemblies, dispose of repaired assemblies, and obtain parts must be reduced to the minimum. The following general rules must be applied in the type operation described in this appendix:

a. Specifically designated supply personnel will deliver reparable items to bins or pallets placed beside the various stations on the line. Other supply personnel will pick up repaired items from the adjacent bins or pallets reserved for completed items. Careful tallies will be kept of deliveries of assemblies to the line for repair, and deliveries of repaired assemblies to storage or shipping locations. This information will be turned in to the stock control section for posting of records.

b. Parts stocks in bins placed beside the line will be replenished as required by supply handlers assigned to that duty. The workload of each individual will be so adjusted that bins may be checked frequently enough to prevent out-of-stock conditions. Each delivery of parts to a bin will be recorded on the tag attached to the bin. At the time each replenishment is made, the stock remaining in the bin will be counted. The total of remaining quantity and the quantity placed in the bin will be entered on the bin card. Quantity expended since the last visit will be recorded and that information delivered to the stock control system.

c. In order that the line may be inactive for the shortest possible period between completion of one run and the start of another, sufficient storage space should be provided beside the line to permit "stocking up" for the next run while stocks for the current run are being phased out. This is particularly important when the duration of the average job orders accomplished in the shop is limited to a few days.

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By Order of *Wilber M. Brucker*, Secretary of the Army:

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For explanation of abbreviations used see AR 320-50.